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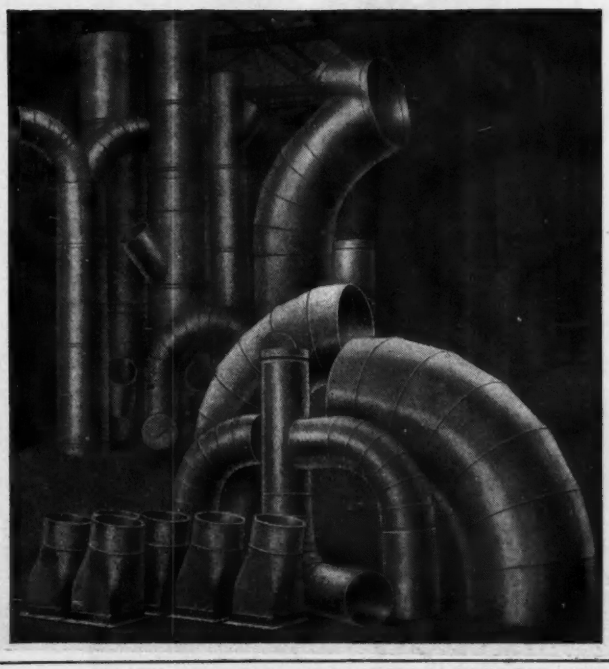

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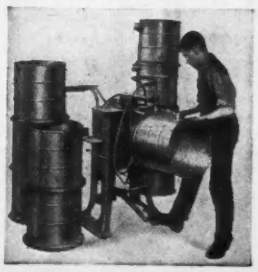

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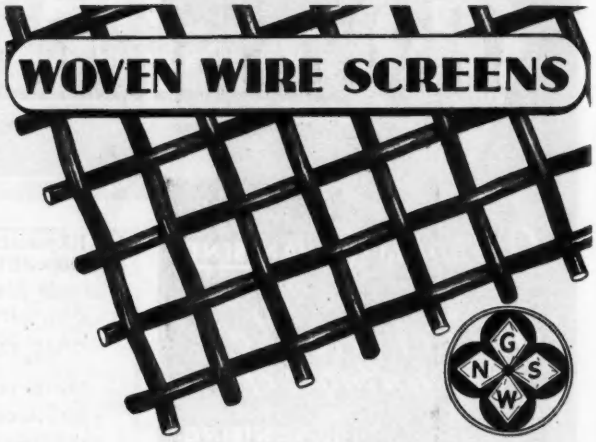

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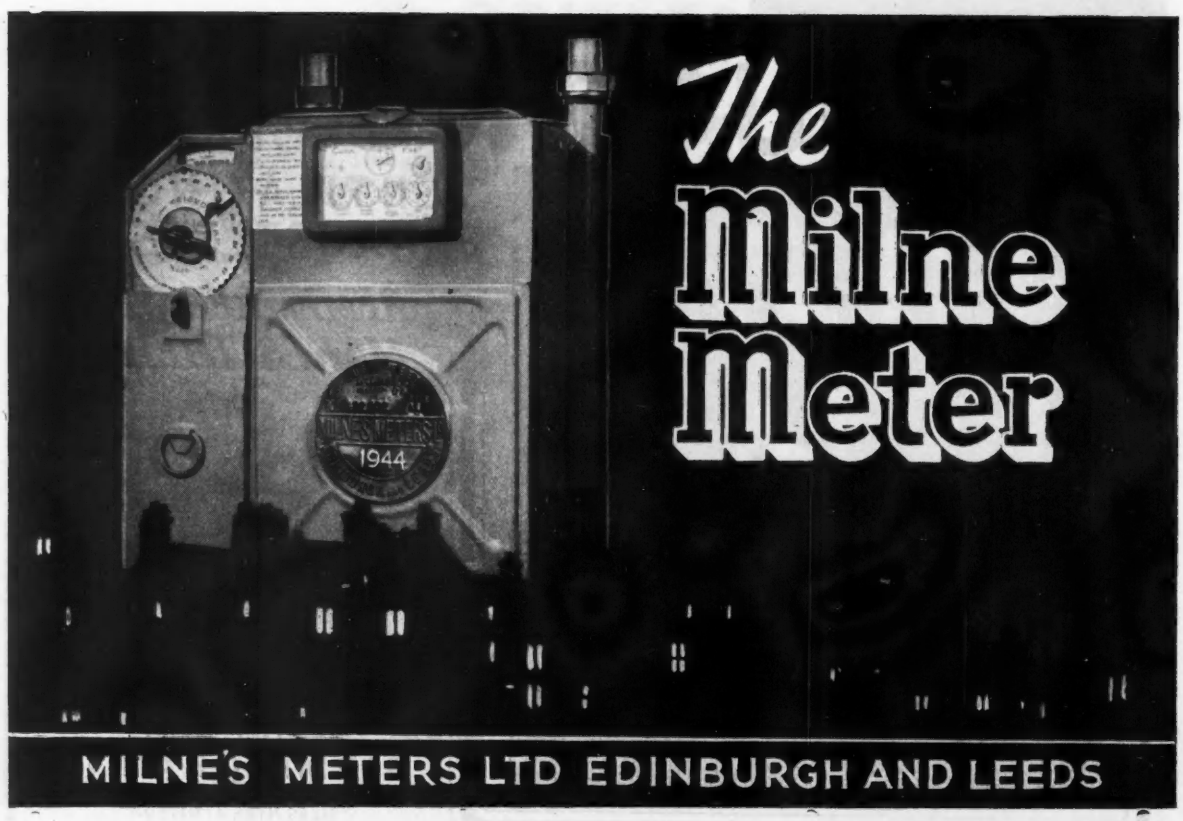

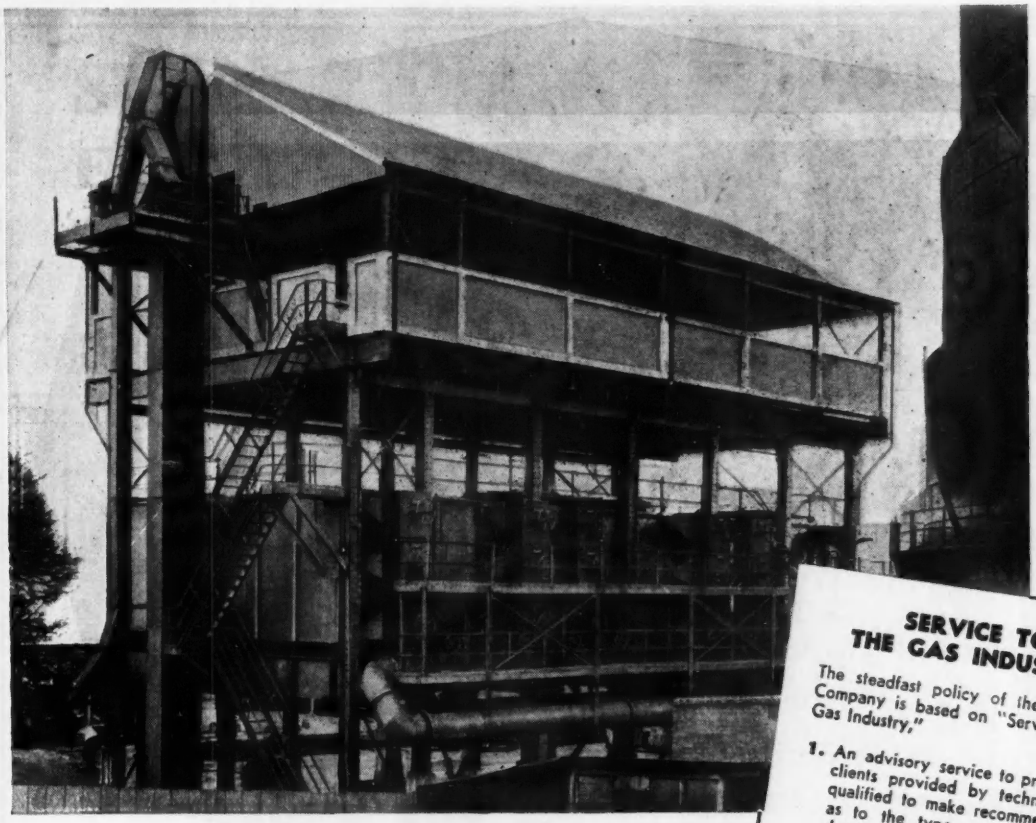

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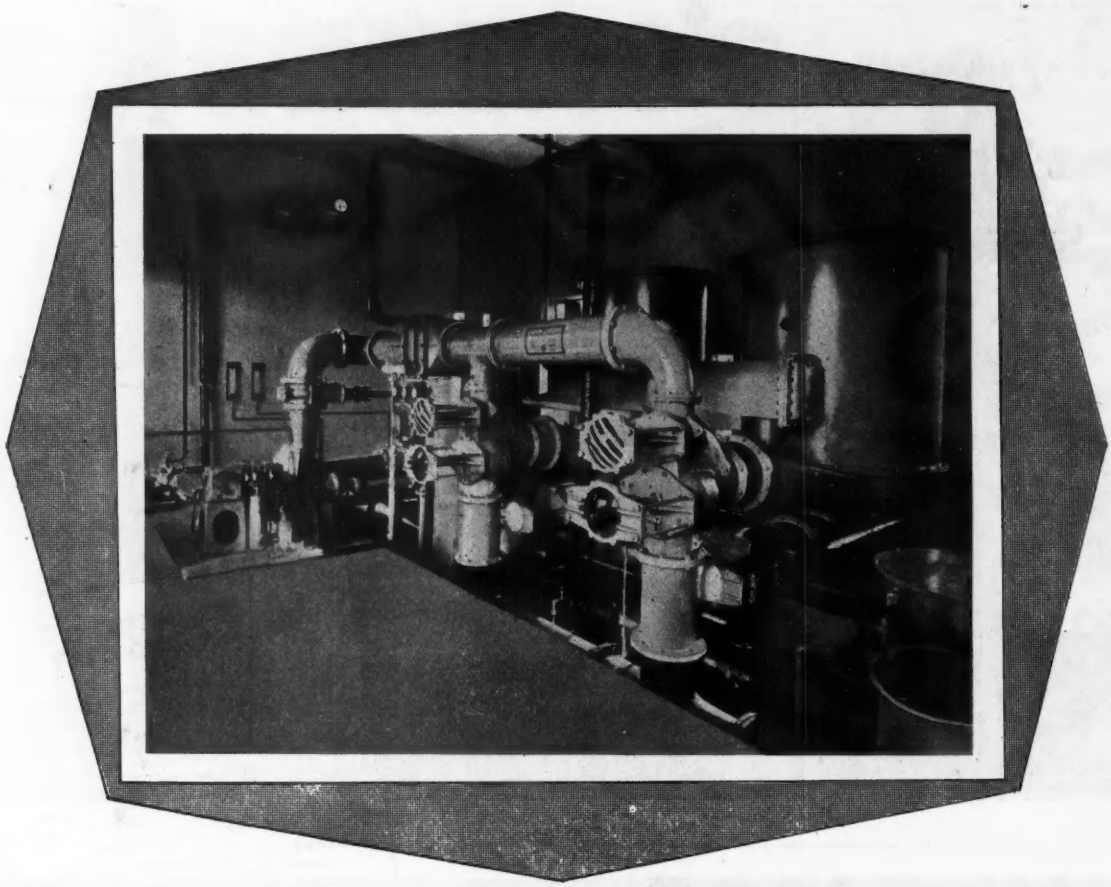

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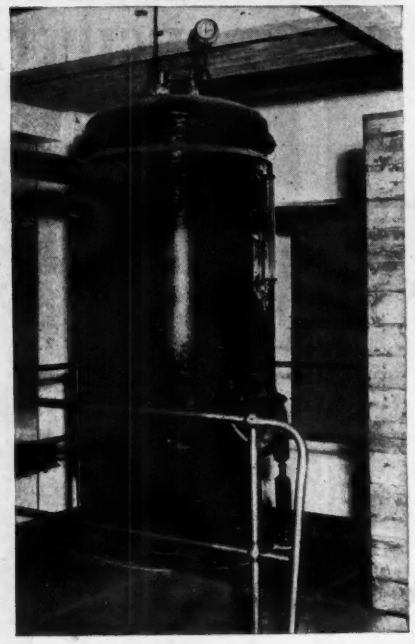

By courtesy of the Middlesex County Council and Messrs. Davey, Paxman & Co. Ltd.

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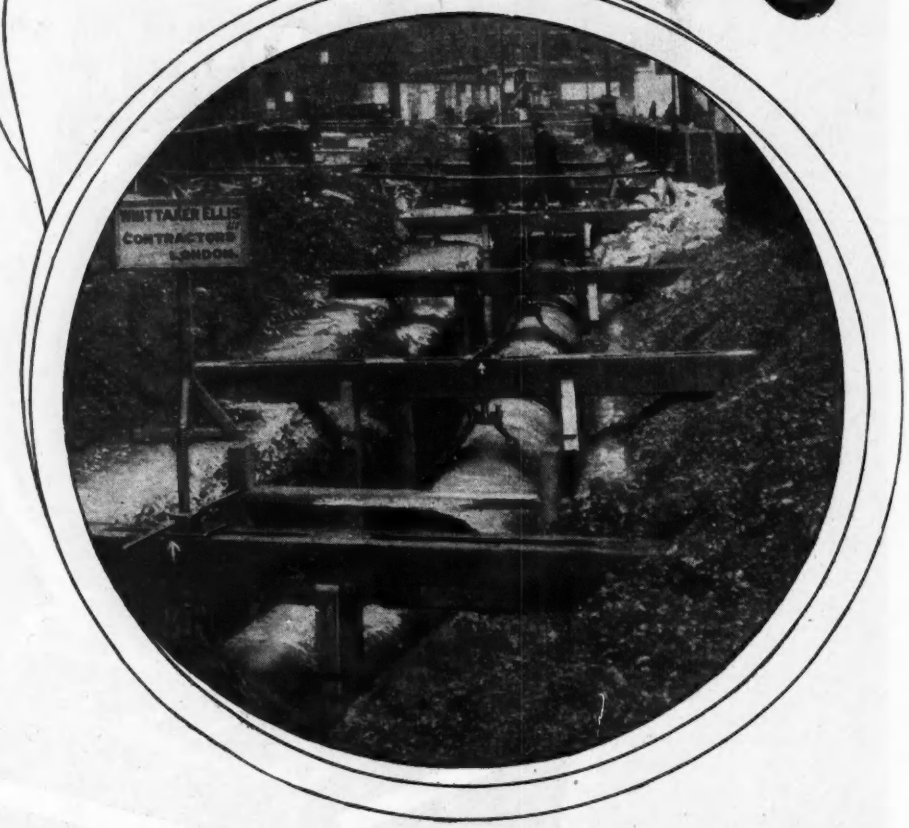

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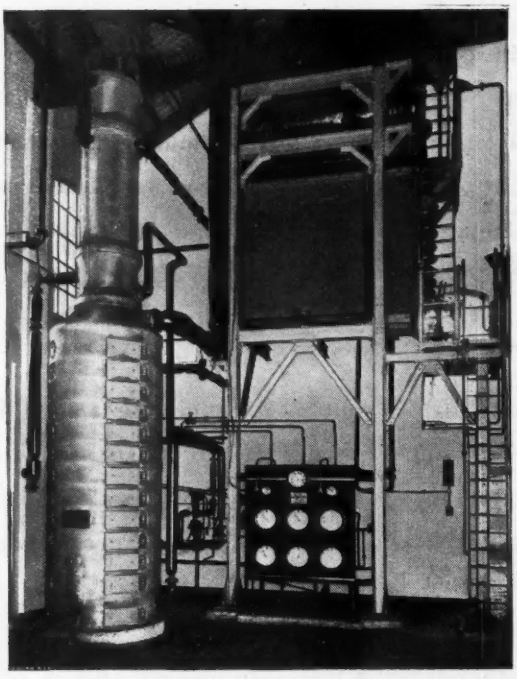

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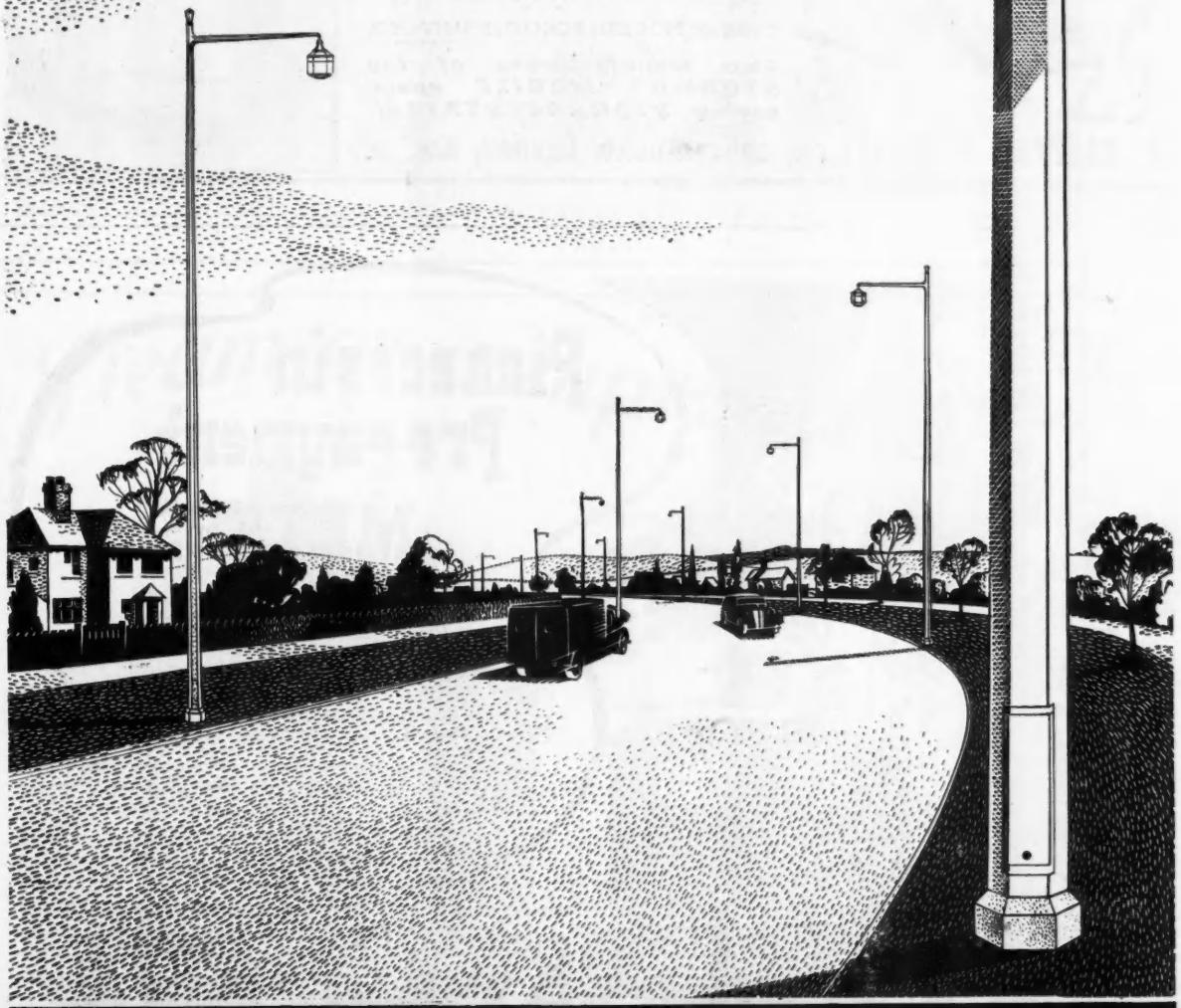

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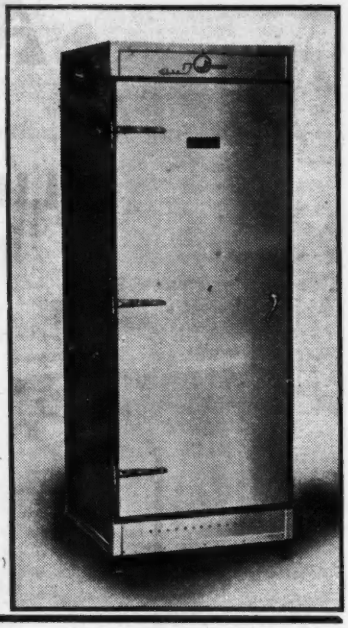

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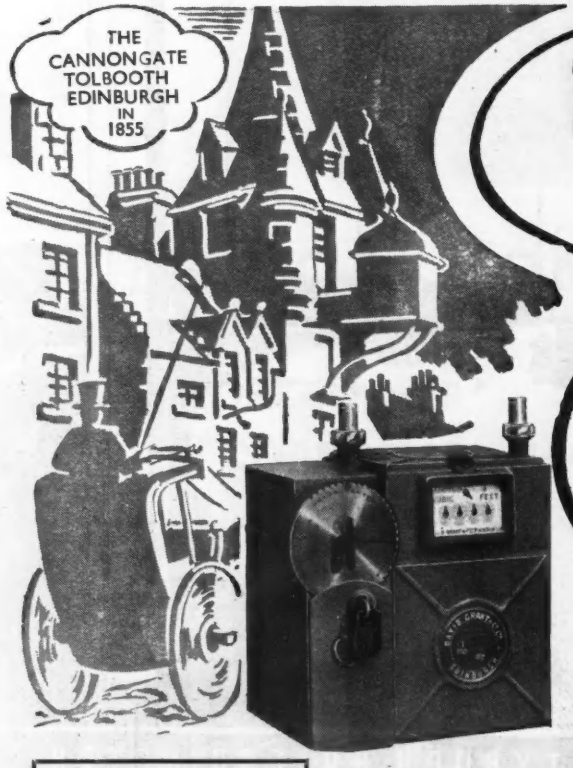

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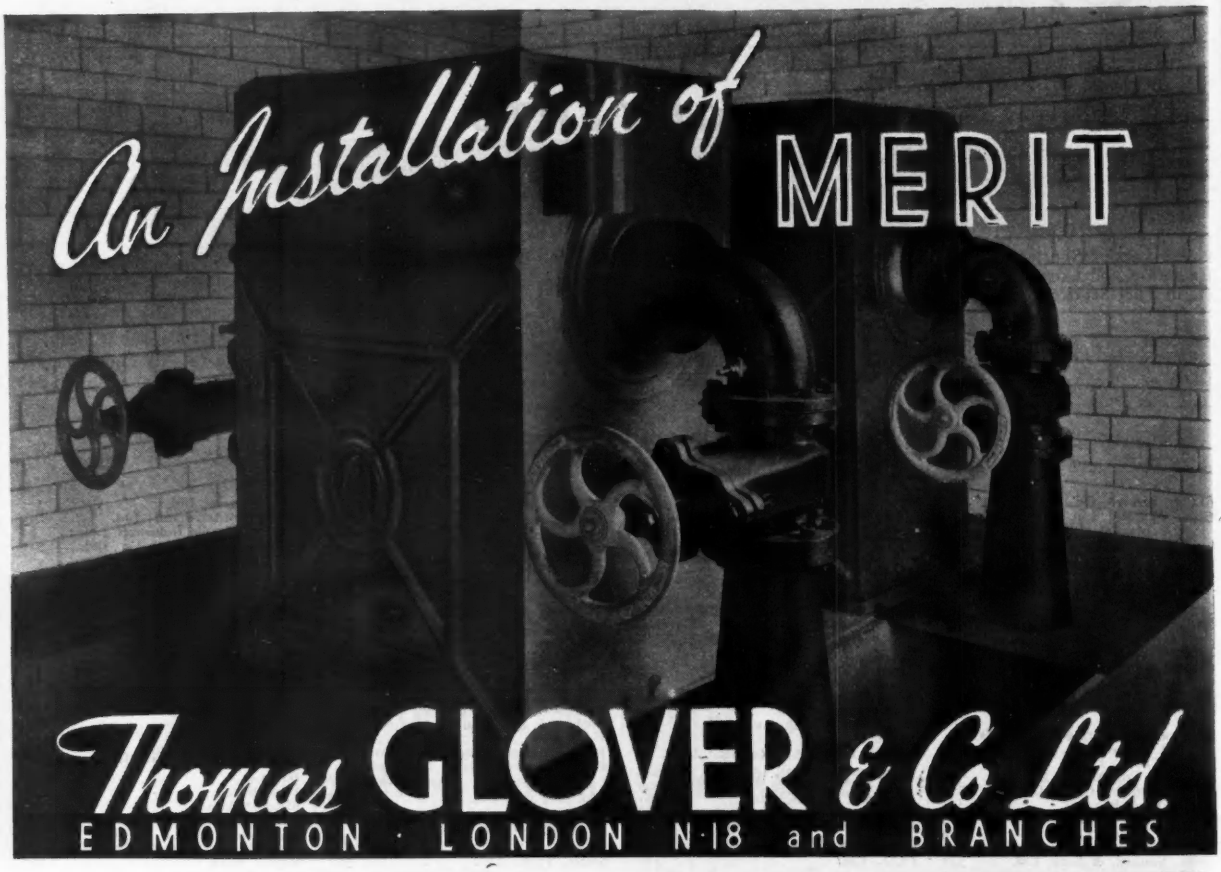

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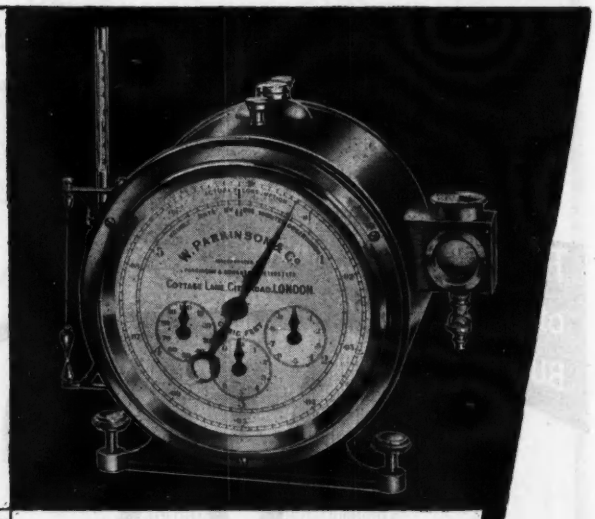

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P.4

GAS JOURNAL, SEPT. 5, 1945

VOL. 246 97th YEAR No. 4294

EDITORIAL NOTES

GRAVE LABOUR SHORTAGE

THE announcement last week that the Government had undertaken as a temporary measure to lend troops to the Gas Light and Coke Company to assist in the maintenance of gas supply was symptomatic of a serious labour shortage which is causing anxiety in a very large number of undertakings throughout the country. It is true that there were special aspects of the position in London—notably the large sacle return of evacuees, the shortage of household coal, and a touch of unfavourable weather—but it is by no means comforting to contemplate what the position is likely to be in a sudden cold spell in mid-winter if in the middle of August supplies can be maintained only by the drastic measure of calling in the Army. Clearly such a step is taken only in extreme cases, and we know of no likelihood of similar action being taken elsewhere, but it is a fact that the labour shortage is one of the gravest problems which many engineers are now facing.

During the war the Industry gave up its workers unstintingly to the Services and contrived to keep going with the help of aged and often far from suitable workers. Demobilization will in time bring back most of the men from the Forces, but for the moment there is not so much as a trickle, and it will be a long time before the groups which comprise the most essential workers come back in any strength. Meanwhile the older men are retiring or becoming too old to work, and no new recruits are coming in. In one recent week something like 3,600 vacancies were notified in the Industry as a whole; 230 of them were filled, but in the same period 250 further men left, so the position at the end of the week was worse that at the beginning.

The only immediate silver lining to the cloud is the Goverment announcement that 45,000 firms which have been on war work are expected to take steps for the release and re-allocation of the labour that will be unwanted now that war contracts are being terminated. There are no statistics to show what proportion of this labour force will be available for the Gas Industry, but it is encouraging to note that the high priority which gas supply must have in peacetime reconstruction has been recognized in a new system of realeases for munition workers which has been devised by the Ministry of Labour's Joint Consultative Committee, on which the T.U.C. and the British Employers' Confederation are represented, with a view to meeting the changing needs of industry in the switch over to peace production. Releases are to be in a priority order of five categories, and former experienced workers in the Gas Industry are specifically mentioned in Category 2 (Category 1 consisting of men for the Forces, including young men previously deferred).

RADIATION AND CONVECTION

AS we have pointed out before, while "electric infra-red" appears to many as a magic formula, there is nothing unique in the properties of the infra-red rays generated by electrical means nor is there anything revolutionary about the application of radiant heat. The application of radiant heating, for both domestic and industrial purposes, has for years been common practice in the Gas Industry, and of late we have described and illustrated many gas-fired infra-red units developed for a wide variety of uses which have given highly satisfactory results. What we would emphasize is that "infra-red" has not come along to oust convection heating; it has its advantages and it also has its limitations. In this connexion we have studied with interest American thought and investigation on the subject and we would call attention to an article on later pages in which the Author lays stress on the fact, for example, that an extremely misleading impression of the relative heating speeds at the moment possible with convection and infra-red equipment can be created by comparing new infra-red installations with convection ovens more than a year or two old; that convection ovens are now available which will cure in 3 to 15 minutes finishes which require 30 to 60 minutes in the best designed convection units of only a few years ago; and that manufacturers using infra-red sources have found desirable auxiliary convection heating.

We have found extremely interesting too what we consider to be fundamental work on the influence of natural convection on the effectiveness of infra-red heating—its bearing on the choice of heating systems—carried out recently in this country in the laboratories of the South Metropolitan Gas Company. We hope shortly to publish an account of this work, but at the moment we may refer very briefly here to a few of the main conclusions drawn from it. Physical considerations in the case of infra-red heating show that the magnitude of the convection loss from the heated object relative to that of the radiation absorbed is all important and that fundamental to this relation is the dependence of the convection loss from an object on its curvature—a factor which in infra-red heating technique appears to have received little, if any, attention. The differences in the maximum temperatures attained by flat and curved objects in ovens in which the heating is effected chiefly by infra-red radiation show the importance of considering the convection losses from the object in order to obtain a correct estimate of the suitability of an oven for a particular process. From comparisons of the performances of ovens having various proportions of convection and radiation components it is clear that a prime factor in the choice between convection and infra-red ovens which confronts every prospective user is curvature of the object of treatment. For instance a relatively high ambient air temperature is not only advantageous but essential for heating to 450°F. a rod of less than one-eighth inch diameter unless an equivalent radiant temperature of more than 720°F. is used. It will, we think, be agreed that the work to which we refer is very important indeed.

ALL-IN FUEL SERVICE CHARGE

ELSEWHERE in this issue we refer to two aspects of the United Kingdom Gas Corporation's enterprise in the domestic field—the gas exhibit at the Leeds "Homes of To-morrow" Exhibition, and the proposed introduction of an all-in "Fuel Service Charge" for new houses. It was at the invitation of the Yorkshire District of the British Gas Council that the U.K. Corporation staged the Leeds exhibit, a highly workmanlike kitchen full of practical rather than hypothetical ideas, and it was fitting that Col. W. Moncrieff Carr should have been the Gas Industry's spokesman at the opening ceremony because as Managing Director of one of the biggest of the holding companies he could tell the public that despite increased coal costs the average price of gas in the subsidiary companies had fallen from 10d. to 8d. a therm since 1939.

Price—or perhaps we should say all-in cost—is a vital factor in the domestic sphere, and in establishing its "Fuel Service Charge" the Corporation is on sound ground. The charge, which is to be applied to new houses of specified types, is based

on the simple domestic tariff of a shilling per week standing charge and half-price gas which is to be re-introduced after wartime suspension. A "standard fuel usage" for a high standard of cooking, heating, hot water, refrigeration, and laundry service points to an annual consumption of 200 therms of gas and 70 cwt. of coke, which at current prices (coke at full price and gas at the commodity half-rate) would cost £20 2s. 6d. per annum in London, or £18 1s. 8d. in the north. Existing consumers on the simple tariff would pay an *average* of 8s. 9d. a week in the south or 8s. in the north for such a service. But with the "Fuel Service Charge" the gas undertaking, while assured of the consumption, would be relieved of collection costs, for the housing authority would collect the charge with the rent, and for that reason the standing charge is reduced to 6d. per week, of which the tenant gets the benefit. With proper safeguards against fuel wastage the scheme has everything to commend it. It is sufficiently rigid to ensure a square deal for the tenant and the house owner, and at the same time sufficiently flexible to enable the gas undertaking to adjust its figures in the light of any substantial rise or fall in the cost of affording the supply. In the hands of an organization whose 56 subsidiaries are spread over Yorkshire, Lincolnshire, Lancashire, Cheshire, South Wales, and the Home Counties it is a scheme which may well lead to a much larger measure of price standardization.

The "GAS JOURNAL" and "GAS SERVICE" will return to London on September 14, from and after which date the Address will once more be the familiar one of long association: No. 11, Bolt Court, Fleet Street, London, E.C. 4. Telephone: Central 2236.

Personal

Retirement of Mr. Ralph Halkett

Mr. RALPH HALKETT, Director and General Manager of the Sheffield and District Gas Company, will retire from the post of General Manager at the end of September. He will, however, retain his seat on the Board, and although he will live in Gloucestershire, he will be in Sheffield frequently, not only as a Director of the Company he has served so devotedly for the past 26 years, but also as a Director of the Wharncliffe Silkstone Colliery Co., the Nunnery Colliery Co., the Nunnery Coke and Gas Co., the Worksop Gas Company, and Thorncliffe Coal Distillation, Ltd. Mr. Halkett will be succeeded in the office of General Manager by his son, Mr. Ralph Halkett, junior, at present Chief Engineer and Assistant General Manager.

Born in Oxfordshire of Scottish parents, Mr. Halkett began his gas career with the Bournemouth Gas and Water Company. After some years in the Leeds Gas Department he went to Glasgow in 1912 as Commercial Superintendent of the Gas Department, and in 1917 he became Assistant General Manager. He became General Manager of the Sheffield Gas Company in 1919 in succession to Mr. Hanbury Thomas, and five years later he was appointed General Manager and Secretary. In October, 1940, he was given a seat on the Board, with the designation of Director and General Manager, his seat on the Board having previously been occupied by the late Sir Robert Hadfield. Mr. Ralph Halkett, junior, who was already Assistant General Manager, became Secretary and Assistant General Manager.

Since Mr. Halkett went to Sheffield in 1919, the Company has risen from the sixth largest undertaking in Great Britain to the second largest, next in size to the Gas Light and Coke Company. His outstanding contribution to the Gas Industry has been his pioneer work in conceiving and inaugurating the first coke oven gas grid in the country, as a result of which Sheffield industry has enjoyed cheap and efficient gas supplies which have been invaluable both in peace and war. Mr. Halkett has been responsible for the promotion of much Parliamentary legislation, including the Bill for the construction of the Yorkshire Gas Grid, which brings into Sheffield between 32,000,000 and 36,000,000 cu.ft. of coke oven gas per day. Gas sales during his period of service have increased from 4,000 million cu.ft. annually to over 14,000,000 cu.ft., the mileage of mains has grown from 600 to 1,400, and the area of supply has been extended from 137 to 328 sq. miles. The Company has absorbed 11 other gas undertakings, and its area now extends from Barnsley to Matlock, all the undertakings being connected by high or low pressure mains to Sheffield.

The structure of the Sheffield and District Gas Company has often been cited as a model of integration, for not only has the supply of gas for industrial purposes been highly developed, but the more remote residential areas which were formerly served by isolated undertakings have been afforded cheap and abundant supplies of gas and have had the benefit of those technical and maintenance services which only a large organization can provide.

It is a coincidence that in the same issue as we announce Mr. Halkett's retirement we should also review briefly the recently published account of the experiences of the Company during the blitz. The raids in December, 1940, caused great destruction, and the largest gas-works was put completely out of action for a few days. The storage capacity was reduced, due to damage sustained, to less than one-third, and six gasholders had to be completely dismantled and rebuilt, and it was only in September, 1944, that the last was completed. At that time the demand for gas was so great that as a result of the irregular working of the coke ovens due to air-raid warnings, &c., the Company was down to less than one hour's supply of gas in the whole of the works almost every week-end.

Mr. Halkett personally superintended the emergency operations immediately after the raids, and his leadership was an inspiration to the men who had the hazardous task of restoring supplies. Two years later he had the pleasure of showing the late Duke of Kent the reconstruction work that had been carried out.

Mr. RALPH HALKETT, junior, who is 39 years of age, and has been with the Company for 20 years, succeeds his father as General Manager on Oct. 1. After serving as an articled pupil with the Sheffield Company, he spent a few years with the Bournemouth Gas and Water Company and went to Germany to study Continental methods with the Ruhr Gas Company in and around Essen. Returning to Sheffield he was appointed Assistant to the General Manager. He has since held the posts of Secretary and Assistant General Manager, and last year he was appointed Chief Engineer and Assistant General Manager. His new designation will be that of General Manager and Chief Engineer. In addition to his duties with the Company, Mr. Halkett, junior, is a temporary civil servant in the Department of the Ministry of War Transport attached to the Regional Transport Commissioner at Leeds.

* * *

Consequent on the retirement of Mr. W. R. DAY, Manager and Secretary of the Banbury Gaslight and Coke Company, the following reorganization of staff has been made to operate from Sept. 12. General Manager and Chief Engineer, Mr. ALEXANDER TRAN; Local Engineer, Mr. A. DUDLEY HILL; Secretary, Mr. A. C. MACHIN; Assistant Secretary, Mr. H. BURDETT.

* * *

Mr. E. A. SMITH, Distribution Engineer of the Guildford Gas Light and Coke Company, has been appointed Senior Representative in the South-West of England of Richmonds Gas Stove Company, Ltd.

* * *

Mr. H. PARKER has been appointed Sales Manager of the Guildford Gas Light and Coke Company.

* * *

Mr. J. W. CARLTON, Distribution Superintendent of the Shipley Gas Department is retiring after nearly 23 years' service. Before going to Shipley Mr. Carlton was with the Hartlepool Gas and Water Company, and also the Cleethorpes Gas Company. He is a Past-President and Honorary Member of the Yorkshire Junior Gas Association, a Past-Chairman of the Yorkshire Gas Salesmen's Circle, and also of the local branch of the National Association of Local Government Officers. His successor is Mr. E. J. HOSKIN, formerly Deputy Distribution Superintendent of the Wigan Gas Department, and previously on the staff of the Stockport Gas Department.

* * *

Lt.-Col. C. J. FALK, M.C., T.D., has been released from the Army and has now resumed his duties with Falk, Stadelmann & Co., Ltd. Col. Falk served throughout the war with the Queen's Royal Regiment.

Obituary

George Dixon

As the senior member of the staff organization that our late Chief, Mr. George Dixon, referred to as "his team," I would like on behalf of each member of that team to pay tribute to a great leader and esteemed friend.

For some considerable time we have been anxious about his health, hoping this would improve so that he could return to his rightful place as captain of the team with all the inspiration he so ably provided.

He endeared himself to all who served under his direction and was admired for his sterling qualities. The support he gave to his staff was unstinted; he was a man of kindly action and consideration at all times. All were encouraged by him to give of their best in the service of the undertaking he so successfully managed. His cheerfulness and spirit never flagged throughout his long illness, and his passing at such an early age is a tragedy and a great loss to the profession he served with unswerving zeal and loyalty, and is to us an irreparable loss.

R. M. W.

* * *

The death occurred on Aug. 31 of Mr. HARRY COATES, Joint Managing Director of the Economic Gas Boiler Co., Ltd.

Diary

Sept. 7.—North British Association of Gas Managers: Annual Meeting, Grosvenor Restaurant, Glasgow, 10.30 a.m.

Sept. 10.—Women's Gas Council, Executive Committee: Gas Industry House, 12.45 p.m., to be followed by visit to Watson House.

Sept. 11.—British Gas Council: Gas Industry House, 2.30 p.m.

Sept. 11.—National Federation of Gas Coke Associations: General Committee, Gas Industry House, 10 a.m.

Sept. 11–13.—Association of Public Lighting Engineers: Conference in Glasgow.

Sept. 13.—National Federation of Gas Coke Associations: National Technical Committee, Gas Industry House, 2.30 p.m.

Sept. 13.—Solid Smokeless Fuels Federation: Technical Committee, Gas Industry House, 10.30 a.m.

Sept. 13.—Wales and Monmouthshire Association of Gas Engineers and Managers: General Meeting, Porthcawl, 10.45 a.m.

Sept. 17.—London and Counties Coke Association: Finance Committee, 11 a.m.; Executive Committee, 11.30 a.m.; Central Committee, 1.30 p.m., Gas Industry House.

Oct. 17.—Eastern Counties Gas Engineers' and Managers' Association: Autumn Meeting, Grosvenor House, Park Lane, W. 1.

Oct. 17.—Institute of Fuel: Royal Geographical Society. Melchett Lecture by Professor C. H. Lander, C.B.E., 6 p.m.

Nov. 27–28.—Institution of Gas Engineers: Autumn Research Meeting.

Distribution Needs Reinforcement

In the course of a Paper to the Western Junior Gas Association Mr. **O. Pincock**, B.Sc.(Eng.), of Western-super-Mare, maintained that the Government housing scheme affords an opportunity for the Industry to show its competence in helping to realize those ideals of domestic comfort which the general public has been taught to expect. We are, he said, no longer dealing with speculative or jobbing builders, but with housing authorities and skilled architects, and the distribution department must have technical men capable of talking to and dealing with the representatives of modern building on an equal basis.

Another important function of the distribution department, he continued, lies in the compilation of all map records of mains, services, syphons, valves, governors, &c., and the investigation of district pressure complaints. The increase in send-out by a number of undertakings has been phenomenally high during the past five years, and by utilizing our resources to the full, present-day send-outs can be maintained and still further increased. To do this large sections of distribution networks will have to be re-designed to cope adequately with present and future demands. Some less fortunate undertakings which have suffered heavily as the result of enemy action will also be contemplating the re-design of large sections of their distribution systems, while all undertakings will shortly have to embark on a programme of six years' deferred repairs. Here, then, is yet another job for the technical department and one that cannot be undertaken without much care and consideration, for the competent distribution engineer must be sufficiently prudent to foresee the trend of developments.

The work of the distributing department, the Author added, is not complete without mention of the public lighting load. We must do all we can to retain and increase the amount of gas sold for public lighting, and this cannot be contemplated without expert technical ability. He included the services of a demonstrator in the build-up of the distribution department, considering this a valuable asset in the "after sales" service so desirable in all cases of new installations. He thought that organized cookery demonstrations were a highly over-rated source of propaganda in the Industry, and that the capital and maintenance costs involved by a cookery demonstration room and lecture theatre could be more profitably employed in actual contacts in the consumer's own kitchen.

Sparking Plug Manufacture

A novel plant, utilizing gas-heated high temperature infra-red units, has recently been installed at the Champion Sparking Plug Company, Hatton, near Feltham. It was designed and constructed by the Gas Light and Coke Company Centre. The plant is used for firing a red printing ink into the white glaze of sillimanite cores of sparking plugs, and it is necessary to heat the core to a temperature of between 650°–700°C. to enable the ink to flow into the glaze and become permanent.

Gas-fired furnaces have been used by this firm for many years, and, although producing a satisfactory product, have, on occasions, been troublesome by reason of mechanical failures or defective baking. These furnaces accommodate 20 sloping nickel tubes, which are heated and maintained at a temperature of 700°C. and down which the printed cores are pushed. The baking takes between 25–40 minutes, depending on the size of the core and, upon leaving the furnace, the cores are cooled by air blast so that girls can handle and inspect every core. This furnace, with a crew of 3 or 4 girls (*i.e.*, one girl feeding the cores through and 2 or 3 girls examining at the discharge end) has turned out as many as 20,000 printed cores per day, but on many occasions the daily output has fallen far below this figure due to bad baking, stoppages by tube distortion, &c. Therefore, the design of this new plant, eliminating the nickel tubes, protecting muffles, heavy brickwork, layout for inspection, &c., appealed to the management of the firm concerned.

The new unit consists of two 12 ft. long special gas fires, about 4 in. high over the horizontal radiant bars ; these two lengths of fire are opposed, and therefore form a tunnel through which pass vertical mild steel rods attached to a Renolds conveyor chain beneath the radiating tunnel. The sillimanite cores are dropped on to the rods, which are spaced at 1 in. centres and travel slowly through the tunnel, taking 4 minutes 40 seconds to traverse the 12 ft. After leaving the tunnel the cores travel back to the operator through a cooling duct, and one girl operating this machine can, in a normal working day, load and unload between 18,000–19,000 cores. The plant has been in use for some time and this is the daily average ; not one badly baked core has been produced.

The Society of British Gas Industries is returning from its wartime offices at Guildford to-morrow (Sept. 6) to its former London offices, 56, Victoria Street, S.W. 1 (Telephone Victoria 8948). It is hoped quickly to overcome such short delay in dealing with correspondence as may result from the removal.

"Atmospheric pollution wastes the work of one million miners for three days each year," said Mr. Charles Gandy, Chairman of the National Smoke Abatement Society, in a speech at the Manchester Planning Exhibition on Aug. 29. Dealing with the remedy, Mr. Gandy said that Manchester Corporation was to apply to Parliament for power to create smokeless zones in the city where soft, bituminous coal could not be burned. With regard to new houses, schemes were being worked out for district heating from a central source for 8,000 dwellings. This would mean a constantly heated house and hot water with no fuel bill for 5s. per week. The open fireplace to be provided would be of a new type designed to burn solid fuel smokelessly.

The Bristol Engineering Manufacturers' Association is organizing an exhibition of engineering products at the Victoria Rooms, Bristol, from Sept. 7 to 15. It will be the first post-war trade exhibition in the City, and is being staged by the only Association of its kind in the country, a local body of nearly 200 engineering firms, established to render mutual help and to pursue collective marketing projects where this proves to be a possibility. The exhibits will range from simple hand tools to aircraft engines, and will include precision instruments and tools, plastics, the latest development in welding processes, new applications of stainless steel, kitchen units, washing machines, cooking units, and automatic office machinery. A competition is being arranged for model engineers as an incentive to interest in the engineering field.

Wigtown Town Council is to increase the price of gas by 1s. 8d. per 1,000 cu.ft., making the cost 10s. per 1,000 cu.ft. The increase has been rendered necessary because of extra expenditure at the gas-works.

The Annual Report of the Accrington and District Gas and Water Board shows a trading surplus of £15,002 on the gas undertaking for the year ended March 31. Gas sales increased during the war by 70%, and the gas revenue surplus now stands at £23,023 against £4,627 before the war. Since 1939 the net indebtedness has been reduced by £83,300, and now stands at £117,101. To meet the needs of estates now being developed, the Board is seeking sanction to borrow £10,000 for new gas mains, and a similar sum for new water mains.

Stirling Gas Company reports record gas sales of 339,000,000 cu.ft. in the year ended May 15, showing an increase of 33.8% on the 1939 figure. Mr. J. F. Miller, Chairman, stated at the annual meeting that a special contribution was made to the war effort in co-operation with the Air Ministry in the manufacture of hydrogen for the balloon barrage in the Scottish areas. A plant had been set up for the examination, overhaul, and testing of the steel high-pressure cylinders required for containing the gas. Final dividends were declared at the rate of 9s. 2d. less tax on the original capital, and 10s. per share on the new Ordinary capital.

Gas and Coke in Homes of To-morrow

The Gas Industry makes a worthy contribution to the *Yorkshire Evening News* "Homes of To-morrow" Exhibition which opened at Lewis's Store, Leeds, on Aug. 23 and continues until Sept. 22. The exhibition, which aims at showing how drudgery can be eliminated from the housewife's common round, is a comprehensive one in which every recent advancement in science, materials, planning, and service is represented. It covers some 30,000 sq. ft. of floor space, and it is anticipated that a million people will have seen it by the time it closes. There has been effective co-operation between the promoters, the industries concerned, the local authorities in Yorkshire, and the public services, and their combined efforts have been backed by good publicity.

The gas exhibit is arranged on behalf of the Yorkshire District of the British Gas Council by the United Kingdom Gas Corporation, Ltd., many of whose undertakings are within the area from which the visitors are drawn. In arranging the exhibit, the Corporation has had the wholehearted co-operation of the District Chairman, Mr. H. Singleton, Huddersfield. The exhibit consists of the U.K.G.C. kitchen, in which in practical form is shown how an all-in heat fuel service can be supplied. The whole thing is representative in every sense, and the suggestions are practical, not hypothetical.

All the equipment required for food preparation and for laundry work and household cleaning is compactly grouped. There is no separate provision for home laundering, which would be done in the kitchen. Washing machine, drying cabinet, and laundry accessories cupboard are contained within the kitchen area. All meals would be taken in the kitchen, which contains an unobstructed dining area where six people can sit down at table in comfort. There is no separate dining room, and the single living room, unencumbered by the business of feeding, remains always available for social and family life. The heat services of the house comprise those for cooking, space heating, and water heating.

In the U.K.G.C. kitchen the main source of heat is a slow combustion coke-burning stove with back boiler, installed in the living room. In addition to heating the living room this appliance heats the water on the calorifier principle, and provides background heating by means of central heating radiators in the kitchen, hall, and on the upstairs landing. Certain additional services are afforded by the domestic hot water installation, namely, a heating coil in the drying cabinet, a hot towel rail in the bathroom, and a warmed airing cupboard on the first floor. Cooking and summer water heating would be carried out by gas, the latter by means of a gas heated circulator connected to the calorifier, and there is a gas heated washing machine and a gas operated refrigerator. The clothes drying cabinet, large enough to contain the whole of the family wash, is equipped with a gas heater unit for summer use when the heating coil is not in operation.

All the house services are centralized, and heat losses are kept to the minimum by the use of a central duct. This duct houses all the supply and waste pipes, the kitchen ventilation, and the flues for the gas and coke fuel appliances. Any necessary plumbing work can be carried out with the minimum of inconvenience, and frozen pipes are obviated. An advantage of this arrangement is that prefabrication is immediately possible, and there is little interference with the structure of the house when connecting up. The provision of the central flue enables the question of kitchen and laundry ventilation to be dealt with positively. A hood is provided over the cooker, gas water heater, sink, refrigerator, and washing machine, vented into the central duct, and connected to flue piping, which permits of the removal of steam, &c.

Prior to its inclusion in the present exhibition, the U.K.G.C. kitchen had been very successfully shown at Bedford, Radcliffe, Hyde, Northwich, Scarborough, Bridlington, and Pudsey. At one of these places the show was opened by the then local Member of Parliament; the fact that he had been impressed with the display was revealed several weeks later, when he applied to the Corporation for a complete installation based on the model exhibit.

In connexion with the exhibition, the organizers are running an "Opinions" contest, and the United Kingdom Gas Corporation has arranged to give one or more gas cookers as first prize, and gas pokers as subsidiary prizes, with free installation in each case.

The exhibition was opened by Professor A. M. Low, President of the Institute of Patentees. Colonel W. Moncrieff Carr, Managing Director of the United Kingdom Gas Corporation, in proposing a vote of thanks to Professor Low, spoke of the development of gas in the West Riding group of companies, and said their annual total sales had expanded by 100% in the last five years. In its post-war planning the Gas Industry was out to meet all the requirements of a house at an inclusive cost of about 8s. per week. The exhibition indicated what private enterprise could do in co-operation with industry working for a common object. The high price of fuels to-day necessitated the use of fuel only with the greatest efficiency, and both in homes and in industry only the most efficient methods must be used in the future. Speaking of the growth of gas sales in the 16 West Riding undertakings south of Leeds, he said that in the last five years domestic sales had increased by 30% and industrial sales by over 300%. That expansion had enabled the companies, notwithstanding the increased cost of basic coal, to sell gas at an average of 8d. per therm in 1944, as compared with 10d. a therm, the average price in 1939.

Colonel Carr added that they had laid a high pressure grid connecting the gas-works. The demand for industrial gas at the present time exceeded three times the present total sales, and they were awaiting an opportunity to build plant to meet that demand.

Among others present at the opening luncheon were Alderman A. R. Bretherick, Chairman of the Leeds Gas Committee, Mr. C. S. Shapley, General Manager, Leeds Gas Department, Mr. J. W. Rodgers, United Kingdom Gas Corporation, Mr. J. W. Brearley, Mexborough and Swinton Gas Board, Mr. W. Smith, Pudsey Gas Company, and representatives of a number of gas appliance manufacturers.

Comprehensive "Fuel Service Charge"

As was broadly indicated at the annual meeting of the U.K. Corporation a few weeks ago, the Corporation is discussing with various housing authorities a proposed comprehensive "Fuel Service Charge" as applied to modern housing estates, incorporating a range of gas- and coke-burning appliances designed to provide a complete smokeless and efficient fuel service. For the purpose of examining the proposals it is assumed that the design of houses will generally conform to that of the U.K. prototype as planned by Arcon, Ltd. The complete fuel service will be provided by means of a scheduled list of appliances comprising—

Kitchen: Cooker, sink heater, washing machine, refrigerator, and clothes dryer.
Dining room: Hot water radiator.
Living room: Coke stove.
Hall and landing: Hot water radiators.
Bedrooms: Two gas fires.

Excluding purchase tax, the cost of these appliances is estimated at £75. Fuel consumption figures have been determined for a period of 52 weeks, the balance of usage as between gas and coke being arrived at by assuming that the coke stove will provide a complete heat service for 35 weeks in each year, and for 17 weeks the usage is estimated as being on the basis of 3/7ths of the complete service. Maximum fuel consumption of the coke stove at full output of 24,000 B.Th.U. per hour is estimated at 3.5 lb. of coke per hour, falling to 0.75 lb. per hour at the minimum output of 6,500 B.Th.U. per hour. It is estimated that on the average room heating and hot water demand the all-round fuel consumption will amount to approximately 2¼ lb. per hour, equivalent to some 70 cwt. of coke per annum on the heating periods specified. For the instantaneous water heater it is assumed that the average requirement for the period of 17 weeks will amount to 80 gall. of hot water per week, raised through 100°F., and assuming an efficiency of 70% at the heater the gas consumption will amount to a total of 20 therms. The washing machine in use one day per week for 50 weeks and boiling 6 gall. of water per use at 40% efficiency will consume about 13 therms per annum. For coke stove ignition a consumption of 15 cu.ft. of gas per ignition is taken to provide for wastage. At the rated consumption of five therms per annum, provision is made for some 60 lightings, which is adequate for the estimated operation period.

For complete gas cooking service the Corporation has adopted a consumption of 80 therms per annum—a figure which has been established in practice and is now generally accepted. For bedroom gas fires it is assumed that the average requirements will be adequately covered by the provision of a 20-minute heating period night and morning—*i.e.*, 40 minutes per day over the accepted heating period of 35 weeks. To provide this service the two gas fires will consume 40 therms per annum. On the basis of these requirements the gas and coke usage will be as follows:

Room.	Appliance.	Fuel consumption per annum. Gas. Therms.	Coke. Cwt.
Kitchen	Cooker	80	—
	Sink heater	20	—
	Washing machine	15	—
	Refrigerator	45	—
	Clothes dryer	5	—
Dining room	Hot water radiator	—	—
Living room	Coke stove	5	70
Hall	Hot water radiator	—	—
Landing	" "	—	—
Bedrooms	Two gas fires	40	—
Total		210	70

These figures provide a very high standard of heat services, and therefore the Corporation has adopted a "standard fuel usage" for this class of property of 200 therms of gas and 70 cwt. of coke per annum. From these details a comprehensive "Fuel Service Charge" which would be collectable in the house rent has been built up in the following manner:

	£	s.	d.
Coke: 70 cwt. per annum at 4s. 1d. per cwt.—*i.e.*, the present bagged and delivered price fixed by the London and Counties Coke Association	14	5	10
Gas: 200 therms per annum at 7d. per therm—*i.e.*, the proposed commodity rate on a two-part tariff	5	16	8
Annual standing charge	1	6	0
Total annual cost	21	8	6

This total could be met by a "Fuel Service Charge" of 8s. 3d. per week. The normal tariff standing charge is reduced by 50%, bearing in mind the assured consumption of 200 therms per annum, and the fact that collection charges on the gas undertaking would be eliminated by the local authority collecting the "Fuel Service Charge" weekly in the rent. In the North of England coke prices are generally lower than in southern districts. Assuming the price of coke to be 3s. 6d. per cwt., the total annual cost would be reduced to £19 7s. 8d., which would be met by a "Fuel Service Charge" of as low as 7s. 6d. per week.

Prices of gas vary, of course, in different parts of the country, and the "Fuel Service Charge" must vary accordingly, but the structure is capable of adoption in any or all of the 56 subsidiary undertakings of the Corporation.

Scholarships in Science, 1946

The Minister of Education proposes to offer for competition in 1946, 20 Royal Scholarships and 11 Studentships in Science for approved courses in Science and Engineering at the Imperial College of Science and Technology. The awards will be made on the results of an examination to be held at the end of April, 1946. Candidates must be British subjects who have not previously studied at the College, or have not been students there for more than a year. There is no age limit. These awards are not open to holders of State Scholarships at Universities, State Bursars, or recognized students at Training Colleges.

The value of a Royal Scholarship or a Studentship is assessed in relation to the needs of the student subject to a maximum award in the case of a Royal Scholar of £100 a year for maintenance, together with the payment of the College fees for the course. A Studentship covers only the payment of fees. If the Minister is not satisfied that assistance is needed to enable the student to follow the approved course, the award will be honorary.

Any assistance given may be varied at any time during the tenure of the award in the light of changes in the financial circumstances of the holder or of his parents or guardian.

Candidates may enter for the examination in any of the following groups, but in one only:

ENGINEERING (GROUP A).
Mathematics; Applied Mechanics; Heat Engines *or* Electrical Engineering; Machine Construction and Drawing *or* Naval Architecture.

PHYSICS AND MATHEMATICS (GROUP B).
Physics; Mathematics; Chemistry.

CHEMISTRY (GROUP C).
Chemistry; Mathematics; Physics.

BIOLOGY (GROUP D).
General Biology *or* Botany *or* Zoology; Mathematics; Physics; Chemistry.

GEOLOGY (GROUP E).
Geology; Mathematics; Physics; Chemistry.

All candidates must satisfy the Ministry of their proficiency in English either at the examination or by previous successes, as is explained in the Syllabus (see later). Candidates taking Engineering (Group A) must also satisfy the Ministry of their proficiency in Physics or Chemistry.

WHITWORTH SCHOLARSHIPS

The Minister will offer for competition at the same examination in 1946 the following awards on the Foundation of Sir Joseph Whitworth to candidates who are British subjects and have obtained the required handicraft experience in a mechanical engineering workshop:

(*a*) Eight Whitworth Scholarships, of which 5 will be tenable for three years and 3 will be tenable for one year, of the value of £150 a year, which may be increased, having regard to the funds available, the expenses of the course, and the needs of the scholar. If the Minister considers that the full amount of the Scholarship is not required it may be reduced in value or made an honorary award.

(*b*) Prizes of £10 each, up to a limit of 25 to unsuccessful competitors whose work appears to deserve recognition. A prize will not be awarded to a competitor who has won a prize in a previous year.

Handicraft Qualification.—At least 30 calendar months during ordinary working hours in a mechanical engineering workshop, which must include not less than 12 months spent on fitting and/or erecting, or at fitting and/or erecting and the lathe, in which case 3 months' fitting or erecting is required. The experience must be completed before May 1 in the year of examination.

(*a*) Candidates for the 3-year Scholarships must be under 26 years of age on May 1 and must not be full-time students. One year Scholarships are also open to candidates following full-time courses who are under 24 on May 1.

(*b*) A Candidate who, during the present war, has served with H.M. Forces, or who has been engaged in work of national importance to which he was directed, or which he entered or in which he remained by permission of the Ministry of Labour and National Service, may deduct from his age a period equivalent in length to such service.

GENERAL

For further information candidates are referred to the Syllabus of the Science Scholarships Examination, which is published in two parts: Part I—Group A: Engineering and Regulations for Whitworth Scholarships. Price 2d.; post free 3d. Part II—Groups B, C, D, and E. Price 3d.; post free 4d. Both documents may be obtained from H.M. Stationery Office, York House, Kingsway, London, W.C.2, or through any bookseller.

Applications for admission to the Examination in 1946 must be made on the prescribed form not later than Jan. 15, 1946. The forms will be supplied on application to the Secretary, Ministry of Education (Awards Branch), 14–22, Lennox Gardens, London, S.W.1. Separate application forms are not required for entry for a Royal Scholarship or Studentship and for a Whitworth Scholarship. Applications by candidates in Scotland should be sent to The Secretary, Scottish Education Department, St. Andrew's House, Edinburgh, 1; by candidates in Northern Ireland to The Secretary, Ministry of Education (Northern Ireland), Stranmillis House, Belfast.

Labour and the Foundries

The President of the Board of Trade, on a recent visit to Manchester, spoke of the problem of recruiting labour to the foundry industry—an industry which in general appears to offer less attractive conditions than the light engineering industry has offered in war-time. Apprentices have not been entering the foundries as they used to do, and it may well be that the industry will figure high on the list of industries for which special Government support will be found on the lines of that promised conditionally to the cotton trade.

The Minister of Labour has set up a committee to inquire into conditions in the foundries—into such matters as dirt, dust, fumes, heating, and ventilation, welfare, and health supervision. The Labour Correspondent of *The Times* has been informed that there is only one-third of the labour necessary to provide the foundries' many contributions to the Government's housing programme, and that a resolute reconditioning of foundries offers the only chance of securing the remainder.

Obsolete Grates in New Houses

The following resolution was passed recently by the Executive Committee of the National Smoke Abatement Society:

"The Committee expresses its grave anxiety at a situation which, judging by replies to questions in the House of Commons by the Minister of Health (June 7) and the Minister of Fuel and Power (June 14), will, in spite of recent considerable advances in design, result in a great number of new houses being fitted with solid fuel-burning appliances of obsolete type and inferior efficiency. This must mean: That there will be a further wasteful consumption of solid fuel during a period of continuing scarcity; that the occupiers of new houses will have permanently higher fuel costs; and that the smoke evil will be extended and intensified.

"The Committee has noted the Parliamentary reply on behalf of the Minister of Fuel and Power (June 13) to the effect that the fuel so wasted will be in the order of one ton per house per annum. This, at present fuel prices, is equivalent to raising the real rent of each house by about 1s. 6d. per week.

"The Committee fully recognizes the difficulties of the present general situation in respect of production, but it cannot avoid the opinion that this particular problem, which so closely affects not only the national economy, public health, and amenity, but the cost of living, the comfort and the amount of domestic work to be done in every house, has been grossly neglected, both in planning and execution. It therefore most strongly urges immediate and determined joint action on the part of the Ministries of Health, Works, and Fuel and Power to make possible the fitting in all new houses, whether permanent or temporary, municipally or privately built, of new appliances of higher efficiency as recommended in the Government's Housing Manual, 1944."

The Society is bringing the resolution to the notice of all housing authorities in the country.

Coal for Power Stations

The Incorporated Municipal Electrical Association has urged on the Electricity Commissioners the view that a coal clause should be devised by which electricity supply undertakings would be able to recover from consumers the increased price of coal. It was suggested that such a clause should be based upon the price of coal at the beginning of the war. This method of raising prices, it was considered, was the best from a "psychological" point of view. In the event of a substantial balance accruing from a revision of prices a reduction would be made to the most deserving consumers.

The question of flat-rate increases in the price of coal, as opposed to percentage increases, was also raised. The Commissioners said that they were fully alive to the situation and had made repeated representations on the subject to the Ministry of Fuel and Power. They were prepared to make further representations, and if these were unsuccessful they would suggest that the Minister should meet representatives of the electricity supply industry.

Wilputte Jubilee

The Wilputte Coke Oven Corporation, New York, has published a new catalogue bringing up to date the story of the developments and improvements in the construction and design of the Wilputte oven. Accompanying the catalogue is a 20-page brochure in which, in the form of a White Paper, Mr. Louis Wilputte, President of the Corporation, discusses the structural and functional aspects of the by-product coke oven. Mr. Wilputte has completed 50 years' activity in the coke oven industry. After several years with Coppee of Belgium he went, in 1903, to British Columbia to build a battery to provide coke for copper smelting. Four years later he joined up with Heinrich Koppers, of Essen, and in his capacity as American Manager of Koppers he designed the first Koppers ovens built by that firm in America. Ovens bearing the Wilputte name began appearing in 1913, and in 1916 Mr. Wilputte established his own company. In 1933 he took over the rights to the American patents of the Otto Company, and so introduced to the United States the radical improvements in heating which that organization had developed.

In sending us copies of the new catalogue and White Paper Mr. Wilputte writes that he is keenly aware that, due to the exigencies of the war, it has not been possible for British coke oven engineers and managers to keep as well posted on American industrial developments as they might wish to be, and for that reason the Corporation will be pleased to send copies of the two publications on application to 40, Rector Street, New York, 6.

A.P.L.E. Conference

The Annual Conference of the Association of Public Lighting Engineers will be held at the Royal Technical College, Glasgow, on Sept. 11, 12, and 13, under the Presidency of Mr. E. J. Stewart, M.A., B.Sc. The following is the programme :

TUESDAY, SEPT. 11.

11 a.m. Annual General Meeting.
2 p.m. Presidential Address by E. J. Stewart.
3 p.m. Prize-winning Paper (winner's name to be announced).
7 p.m. Civic reception by the Lord Provost and Members of the City Council, at the City Chambers, George Square.

WEDNESDAY, SEPT. 12.

10 a.m. Paper, "Glasgow's Street Lighting," by J. M. Ward.
12.15 p.m. Conference Luncheon at the Grosvenor Restaurant.
3 p.m. Paper, "Lighting of Bends, Junctions, and Roundabouts," by F. J. Middleton.
4 p.m. Address by Dr. J. W. T. Walsh, who will outline the work of the Drafting Sub-Committee responsible for the B.S.I. Specification on Street Lighting to implement the M.O.T. Report, 1937.
6.30 to 10.30 p.m.—Reception at the Glasgow Corporation Lighting Department and visit to Exhibition and demonstrations in the Laboratories. (It is hoped that arrangements may be made for visitors to be taken by motor coaches to inspect street lighting installations).

THURSDAY, SEPT. 13.

10.30 a.m. Paper, "Engineering Principles in Street Lighting Design," by J. S. Smyth, B.Sc.(Eng.) and J. G. Christopher.
2 p.m. Paper, "The Commercial Aspect of Public Lighting," by E. S. Harris.

An Exhibition of street lighting equipment will be open each day of the Conference at 20, Trongate.

Sheffield's Two Air Raids

While many parts of the country had to endure air raids extending over periods of years during the war, Sheffield's ordeal was confined to two dates, Dec. 12 and 15, 1940, but in those two short and memorable nights the city sustained enormous damage, of which the Sheffield and District Gas Company had its full share. The effects of those two raids on the gas supply of the city and surrounding district are vividly described and illustrated in a 44-page brochure issued by the Gas Company and compiled by Mr. W. T. Hird from data provided by the various departments of the Company.

The carbonizing plants at the Neepsend and Grimethorpe stations escaped major damage, but the very extensive damage to roofs and black-out screens made it impossible to use the plants until they could be restored. The crude gas grid mains were in a position to collect what gas was available from the coking plants when the Sheffield stations were able to handle it. Despite considerable damage to buildings, the purifier boxes were not seriously damaged and their condition was not a major factor affecting the gas supply.

Six gasholders with a total capacity of 9,894,000 cu.ft. were completely destroyed, one holder of 7,710,000 cu.ft. capacity was damaged and out of action, one of 1,803,000 cu.ft. was damaged, but capable of use, and four holders with a total capacity of 9,589,000 cu.ft. were undamaged. The Company was thus left with considerably more than half its storage out of action. Some of the ancillary plant at the various stations was destroyed and much was damaged, but the policy of duplication and dispersal of plant achieved its purpose and with a certain amount of improvization, enough was available to meet immediate requirements. Two of the district governors at Neepsend were destroyed and the remaining governor was so badly damaged that it required rebuilding before being capable of use. Many hundreds of reports of broken mains were received, and 800 miles of mains had to be emptied of gas. The report gives full details of the complicated work that was involved in maintaining priority supplies to the industrial districts and restoring supplies in other parts of the area.

The total holder capacity, amounting to 28,996,000 cu.ft. on Dec. 12, 1940, was reduced to 11,392,000 cu.ft. by Dec. 16, but within five weeks repairs had been carried out to the extent that the total was raised to 19,101,800 cu.ft., and by six further stages the storage was built up to a total of 29,221,300 cu.ft. by Nov. 12, 1943. Three days before the first raid the Company sent out 49,000,000 cu.ft. of gas, then one of the largest day's outputs in its histroy. On Dec. 16 it sent out only 1,458,000 cu.ft., but by Dec. 23 the daily output had risen to 13,192,000 cu.ft., and it went up gradually to 44,600,000 cu.ft. on Feb. 3, 1941. Despite the handicap of having less than 20 million cu.ft. of holder capacity, the Company was able on Nov. 17, 1941, to break all previous records by sending out 50,296,000 cu.ft. of gas and exceeded that figure several times during the following winter months.

On June 12, 1942, the late Duke of Kent visited the Neepsend works and inspected the damage and the reconstruction that had taken place in the interval. A number of the men who had carried on valiantly during the raid and the reconstruction period were presented to him, together with the chief officials of the Company.

Street Lighting in Glasgow and Edinburgh is not likely to be curtailed as a result of the fuel economy appeal of the Ministry of Fuel and Power, as pre-war standards of lighting have not been reverted to. Glasgow is already saving £50,000 a year on its lighting compared with pre-war expenditure, and it is contended that any further curtailment would tend to increase street accidents and crime.

That there will be no increase in the price of gas, notwithstanding the rise in the cost of coal, was the decision arrived at by the Gas Committee of the Corporation of Glasgow, which met recently to lay plans for the current year. The present tariff shows a rate of 3s. 10d. per 1,000 cu.ft. for the ordinary domestic consumption of gas. An increase in the cost of fuel amounting to approximately £150,000 over the year, will have to be met by the Gas Department. At present the price paid for coal is 46s. 6d. per ton; 21s. 6d. was the price paid in 1938/39. It was pointed out by Councillor John Storrie, Convener of the Committee, that the domestic consumption of gas rose by about 11% in the past year, and an even greater increase was expected in the coming winter owing to the coal shortage.

Wellingborough Gas Light Company's Report for the year ended June 30 records that gas sales increased from 344 million cu.ft. in 1940 to 453 million cu.ft. last year. The balance carried to net revenue account was £13,274, and the dividends are 7½% on the Original shares and 6% on the Additional shares, the same as for the previous year, leaving £3,360 to be carried forward. In 1941 the Company agreed to act as agents for the Air Ministry in connexion with plant for the manufacture of compressed hydrogen, urgently needed for operational purposes. The plant installed by the Air Ministry was operated continuously until the cessation of flying bomb attacks last year. The compressed hydrogen produced, amounting to 130 million cu.ft., was mainly used for filling barrage balloons. The Company is still engaged in other special work for the Air Ministry. A constant supply of gas was maintained throughout the war, although there were several incidents in which mains were damaged by bombs.

A GREAT DAY HAS DAWNED. With our hearts filled with thankfulness for victory, let us make this great resolve! Let us continue in our striving for a land free from anxiety and want—that the sacrifices of war may not have been in vain.

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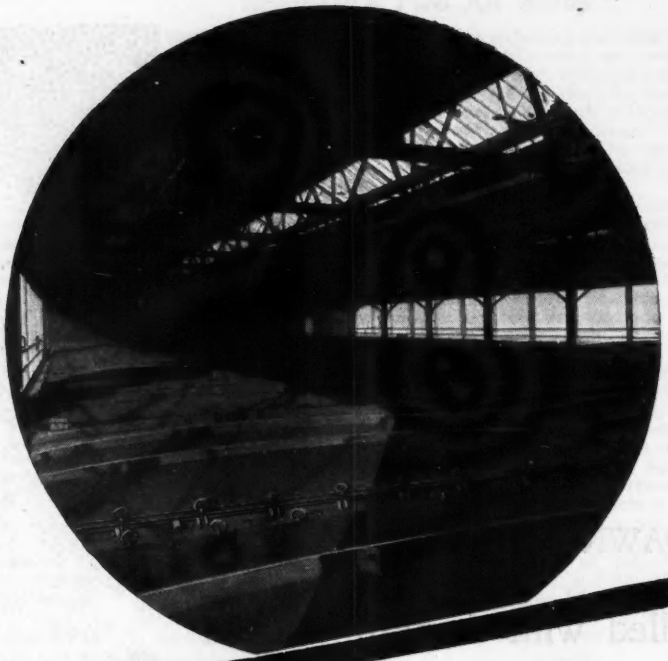

GAS PURIFIERS
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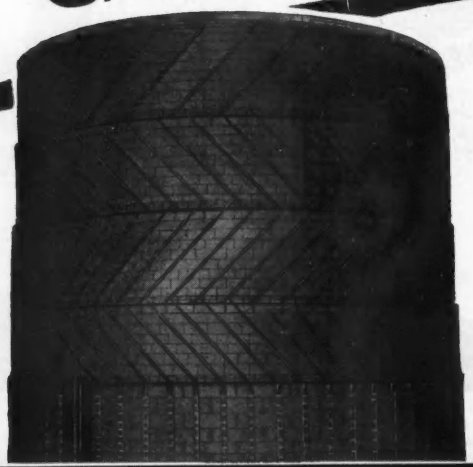

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No. 2

Atomic Energy

[Specially Contributed]

This is the second of our series of articles on the phenomena of the release of atomic energy and its possible bearing on the Gas Industry. The first article was published in our issue last week and has already aroused widespread interest.

Nuclear Change

THE spontaneous transformation of one element into another, known as radio-activity, takes place by the emission of particles from the nucleus, known as the α- and β-particles. The α-particle is the helium nucleus and has four units of mass and two positive charges. Its loss therefore involves the corresponding loss of two planetary electrons, and hence a transmutation into an element of atomic number two units lower than that of the first element. The β-particle is identical with the electron, and therefore its loss from the nucleus increases the number of positive charges by one, which involves transmutation into an element of atomic number one unit greater. The new elements may themselves be radio-active and change into other radio-active substances. Thus a series is known which starts with uranium, decays with thirteen intermediate products including radium, and ends with lead.

Rutherford, in 1919, was the first to produce transmutations of elements artificially. He allowed α-particles from radium to pass into nitrogen, and showed that when an α-particle hit a nitrogen nucleus protons were ejected—*i.e.*, that hydrogen was formed. The other product could have been carbon of mass 13 or oxygen of mass 17 corresponding to the escape or capture of the α-particle after collision. Blackett (*Proc. Roy. Soc.*, 1925, A, **107**, 349) showed that the other product was oxygen. Similar results were obtained by bombarding other light elements, but in all cases the number of effective collisions was very small. The method, though of great theoretical interest, could not be generally considered as a means of transmuting one element into another on a practical scale.

Bombarding Agents

After Rutherford's early work other types of particle besides α-particles were used for disrupting nuclei. These were protons, deuterons (nuclei of " heavy " hydrogen of mass 2), neutrons, and helium ions. A useful instrument for producing high velocity particles was the cyclotron invented by Lawrence. An oscillating high tension was applied to two evacuated hollow hemispheres placed in a strong magnetic field. A charged particle in the hemisphere which was momentarily charged to the opposite sign would gain energy by electrostatic attraction, but would travel in a strongly curved path owing to the magnetic field. This curvature caused it to leave the hemisphere and enter the other, but the apparatus was so adjusted to the type of particle it was desired to accelerate that the sign of the electric charge on the hemisphere altered just as the particle entered it. It therefore received a second impulse which was repeated each time it left one hemisphere for the other. Thus a particle might receive 300 impulses of 4,000 volts and leave the apparatus with an energy corresponding to 1.2 million volts. The Berkeley cyclotron is designed to produce deuterons of 100 million volts. (Chadwick, *Nature*, 1938, **142**, 630 ; Oliphant, *Nature*, 1941, **148**, 717.)

The Neutron

The neutron has been found to be a particularly penetrating particle because its lack of charge makes it unaffected by electrical repulsions. Neutrons are usually produced by bombarding lithium with fast deuterons or beryllium with α-particles from radium.

Nuclear Fission

In 1938 a fundamentally different type of nuclear change was discovered by three Germans, Hahn, Meitner, and Strassmann, who bombarded uranium with neutrons. Up till that time all known nuclear transformations, natural or artificial, had consisted of the detaching of a light particle from the nucleus so that the other fragment was of much the same weight as the original. The disintegration of uranium by neutrons was different in that two fragments of comparable size were produced. The products were radio-active, and they were identified by precipitation with known substances and seeing which precipitates were radio-active. In this way it was found that fragments of weight about 135 and about 100 were produced, barium, lanthanum and other substances being identified. On the average three neutrons per fission were also produced. These might disrupt other uranium nuclei so that there was the possibility of an explosive or chain reaction being started. This activity was found to take place with the uranium isotope of weight 235, written as U_{235}, which occurs with the commer U_{238} to the extent of about 0.7%. It is disrupted by comparatively slowly moving neutrons.

Energy from Nuclear Fission

The energy produced by the nuclear fission of U_{235} was determined by Henderson (*Phys. Rev.*, 1939, **56**, 703) to be about 200 M.e.v. (million electron-volts). The electron volt is the usual measure of energy in nuclear physics. By multiplying by the charge on the electron and converting to electro-magnetic units it can be shown to be equal to 1.6×10^{-12} ergs or 2.3×10^{4} cals. gm./mol. The energy evolved from U_{235} is therefore very large, being equal to about 2×10^{10} cals./gm. or 3.6×10^{10} B.Th.U./lb. This energy comes from the disappearance of a small amount of mass when the nucleus is disrupted. Einstein showed that one gramme of matter is equivalent to 9×10^{20} ergs (numerically equal to the square of the velocity of light) or about 2×10^{13} cals. Aston expressed the change of mass on packing together protons and neutrons to form nuclei by means of a " packing fraction " which he defined as 10^{4} times the difference between the atomic weight and the nearest whole number, divided by the atomic weight. The value of the packing fraction varies in a regular way with the atomic number of an element. It has a value of about +80 for hydrogen, falls to zero at fluorine, becomes negative with a minimum value at tin, and then increases again so that it becomes zero for mercury, and is positive for the heavier elements. If a nucleus is converted to one of lower packing fraction mass must disappear and energy be released. Thus it is thought that the energy of the stars is maintained by the conversion of hydrogen to helium. Energy can also be released by the disruption of a heavy element into one of medium weight, which is what happens when U_{235} is disrupted.

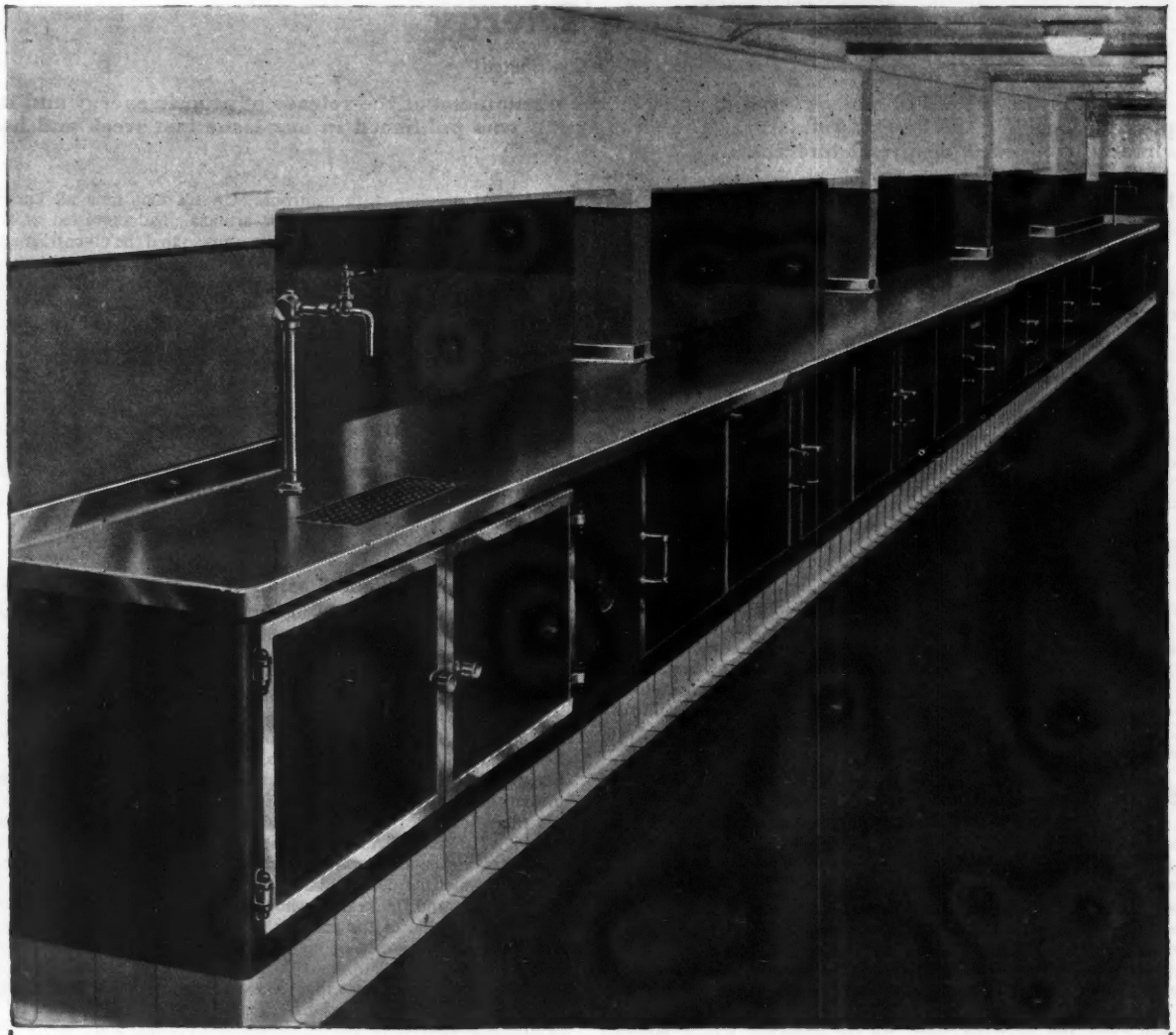
The Atomic Bomb

Many speculations about the working of the atomic bomb have been made in the Press, and it is not proposed to add to these in any detail here. In principle it seems fairly certain that nuclei of U_{235} are disrupted by neutrons derived in the first place from beryllium and radium. Neutrons of energy 4 M.e.v. are emitted which are slowed down to 0.025 M.e.v. possibly by passing them through paraffin wax containing heavy hydrogen. These neutrons have the right energy to disrupt further nuclei of U_{235}. There is no sudden evolution of large masses of gas as in an ordinary explosive, but the whole mass becomes extremely hot and an enormously powerful blast wave results owing to the heating of the air.

E. H. M. B.

Lecture No. 7, in the seventh of the second series of technical discussions arranged by the Association of British Chemical Manufacturers on the efficient use of fuel and power in chemical processes, dealt with inhibition of corrosion of metal in contact with water and/or steam. The Paper was presented and discussions were held in London and Manchester. The discussions were welcomed in all quarters as making a considerable contribution to the exchange of useful information in this field.

The Annual Meeting of the North British Association of Gas Managers will be held in the Grosvenor Restaurant, Glasgow, on Friday, Sept. 7, under the Presidency of Mr. A. Jamieson, of Johnstone. Dr. E. W. Smith, C.B.E., will deliver the William Young Memorial Lecture, following which there will be a Paper by Mr. D. L. Dickson, of Airdrie. Arrangements have been made for a Victory Golf Competition to be held on the Hilton Park Golf Course to-morrow. The meeting on the 7th will begin at 10.30 and there will be a luncheon at 1.15 p.m.



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Infra-Red versus Convection Heating*

By CHARLES C. EELES

PURCHASERS of modern ovens seek methods and equipment which will best cure industrial finishes with optimum speed while utilizing the most convenient handling method, producing the finest working conditions, occupying the least space, offering the greatest flexibility, and resulting in minimum overall costs. Obviously the resolution of so many desirable features into a single unit involves considerable compromise. Designers must weigh several major variables about which there exists a certain diversity of opinion. The end use—drying, core baking, low temperature heat treatment, or the curing of industrial finishes—is of primary importance.

Industrial finish curing furnishes the chief battleground for infra-red versus convection heating. In general, therefore, this discussion will be limited to that field, but the principles developed can easily be translated into their effects on other processes using industrial ovens. Our objective is to determine the relative merit and future possibilities of so-called "convection" and "infra-red" equipment for curing industrial finishes. As used here, "convection" equipment refers to ovens which deliver heat to the work chamber solely by a stream of hot air from an externally mounted air heater, and "infra-red" equipment designates those which transfer fuel energy to heat in the work chamber entirely by means of high temperature radiant sources (either gas or electric) located therein.

Heat Transfer Methods

Heat transfer is accomplished in three ways—conduction, radiation, and convection. There is seldom a heat transfer problem which does not embody all three. However, one is generally dominant, or at least seems to be, and we then characterize the entire process by this predominating method.

Conduction, which is the transfer of heat from the hotter to the colder portion of a single body or structure, enters oven problems in the form of heat losses through the oven shell and exposed sections of the heating system. Likewise heavy sections and those shielded from direct radiation or convection receive heat by conduction from adjacent sections. As a means of actually transferring heat from the primary source to the work in industrial ovens, however, it is relatively unimportant compared with radiation and convection. It will, therefore, be neglected in this discussion.

Whenever a difference in temperature exists between two bodies, there is an exchange of radiant energy. This type of heat transfer is accomplished by means of rays from that portion of the electromagnetic spectrum lying adjacent to light and commonly known as the infra-red band. Although invisible, they follow the laws of light such as straight line radiation in all directions from the source, high absorption by dark rough-surfaced bodies, and reflection from light-coloured highly polished surfaces. Heat transfer by this method increases rapidly with difference in temperature between the source and receiving body, being always proportional to the difference in the fourth powers of their absolute temperatures and to the radiant intensity impressed upon the receiving area.

Since radiation is in all directions from the source, the greater the distance between the source and the receiving surface, the fewer rays actually impinge on this surface. Thus radiant intensity varies inversely as the square of the distance from the source. Although proper reflectors will somewhat modify this law, normally the intensity at 2 ft. will be $\frac{1}{4}$ and at 3 ft. $\frac{1}{9}$ of what it is at 1 ft.

Heat exchange by convection is proportional to the temperature difference between the hot air and the receiving surface, and to the rate at which this hot air is delivered measured in weight per unit of time.

Finish curing is directly dependent upon heating the work piece, and there is no reason to suppose that a unit of heat works any more or less rapidly when supplied by one method than another. Rate of heating is controlled solely by the quantity of heat furnished to and absorbed by the work in a given time.

Finish Types and Characteristics

Industrial finishes for metals arrange themselves in three principal groups: Lacquers, Synthetics, and Oleoresins. Combinations of two or more types may likewise be encountered.

Lacquers cure by evaporation of thinner. Since the temperature allowable without damage to these finishes is low and their curing time pretty well fixed, they do not lend themselves well to much shortening of curing cycles.

Oleoresins—which group includes those commonly known as "japans" and "varnishes"—cure primarily through oxidation, but they likewise require polymerization and evaporation of thinner. Some improvement has resulted in their curing cycles through faster heating of the material, but the basic oxidizing process requires a comparatively long time, and substantial reductions in curing cycles are, therefore, difficult to attain.

Synthetics cure basically through polymerization and to a certain extent by evaporization of thinner. Curing time is a function of the work piece temperature so they are the ones best adapted to short-cycle curing. One paint of this type requires 60 minutes to dry at 180°F., yet only 1 minute at 230°F.

Each finish has an optimum baking range below which results are too slow and above which damage occurs. A definite time is required to obtain a proper cure at every temperature within these limits. Obviously the specific make-up of a finish establishes the manner of curing, and the time-temperature cycle by which such cure can be effected. Assuming sufficient fresh air is available to carry off the thinner vapours and provide enough oxygen to complete any chemical reaction requiring it, the curing time decreases with increase in temperature, and is irrespective of whether the heat is applied by radiation, convection, or conduction. Finishes in general are not unfavourably affected by products of gas combustion, and hence lend themselves well to processing in direct gas-fired convection ovens. Infra-red is all right for thermosetting resins, but not for the nitro-cellulose base automotive finishes. White finishes are likewise difficult to cure perfectly with infra-red.

Infra-Red Characteristics

Industrial drying and finish curing using the "infra-red principle" underwent the usual period of glowing promises and extravagant claims before its true possibilities and limitations were thoroughly explored. Being subject to laws similar to those of light, the colour, smoothness, shape and mass of the object to be heated strongly influence heating cycles. Even highly polished surfaces under the paint reflect the rays sufficiently to retard completion of the cure.

The temperature of infra-red sources is always far above that required to effect a proper cure. Overheating can occur rapidly if exposure time is too long. Conditions must, therefore, be so adjusted that regardless of section, colour, or difference in radiant intensity, the required curing times of all surfaces handled in a single unit are equalized.

Tests show that infra-red definitely does not bake from the inside out and its results are, therefore, not independent of heavy or light sections. A unit set and timed to properly bake a certain finish on 16 gauge metal can badly overbake the same finish on 28 gauge and underbake it on 12 gauge.

Heat Intensity

Heat intensity constitutes the other major variable. With age both lamps and reflectors become filmed with baked-on paint vapours, or other foreign substances. These effects reduce the efficiency of the lamp bank, and consequently the intensity of radiation concentrated on the surfaces being finished. If the lamps cannot "see" all surfaces uniformly or if certain sections are in "shadow," still further variation exists in the impressed intensity of radiation.

Where properly adapted, infra-red sources transfer heat at extremely high rates, and advantage can often be taken of this fact where work and proper oven design permit. However, the difficulty of exercising complete control is obvious, and explains why ovens transferring the major portion of their heat by infra-red are definitely limited in their application.

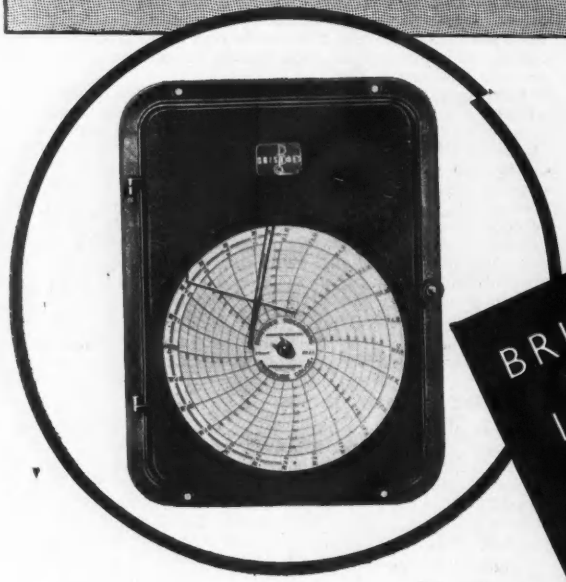
There are three general methods of minimizing those difficulties. A battery of ovens may be used, each one designed solely for baking of one part or parts closely related in colour, size, shape, and section. Paints may be so formulated that slow baking compositions with high curing temperatures are applied to sections which heat rapidly, and fast curing low temperature finishes used on those which heat more sluggishly. This reformulation usually includes the addition of special pigments which are highly opaque to infra-red rays, thus reducing reflection and increasing absorption. The complications and expense of either method are obvious. The better way is the application of some levelling influence such as convection heating. To decrease somewhat the troubles which plague operators of infra-red units, one oven manufacturer has designed a system for circulating air heated to about 50°F. above curing temperature which can be added to infra-red ovens. By this means curing times may be cut in half, and many other undesirable features accruing from infra-red heating minimized.

Convection Characteristics

Modern convection ovens use externally mounted air heaters where the fuel is burned. Fans circulate oven atmosphere plus the proper amount of fresh air through the heater. This heated air is then delivered to the oven by duct work designed to distribute it evenly. While in contact with work and walls, the air temperature is reduced. The cooled air then returns to the heater for reheating, after which the cycle is repeated.

From a Paper to the American Gas Association published in the A.G.A. *Monthly*.

PUBLIC UTILITIES' SERVANT



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With this system no portion of the work, regardless of section, can ever attain a temperature higher than that of the inlet heated air stream. Close control may be exercised over uniformity merely by limiting the maximum temperature of the heated air. Heat delivery and, therefore, heating rates are increased by increasing the differential between heated air and work temperatures and/or by increasing the weight of heated air circulated per unit of time. High velocities sweep away the layer of stagnant air clinging to work surfaces, decreasing film coefficients and speeding heat transfer. Tests have shown curing times with convection heating very inversely as the 1.8 power of the ratio of oven temperatures in excess of 150°F. Thus:

$$\text{Time II} = \text{Time I} \frac{(\text{Temp. I}-150)^{1.8}}{(\text{Temp. II}-150)}$$

Design practice for convection ovens calculates all heat deliveries, volumes, velocities, and static pressures at 60°F. Suitable corrections are then made for operating temperatures to allow proper selection of fan size and horse power. Complicated calculations involving the variance in air weight per cubic foot with temperature change are thus avoided.

The vitally important fact not generally recognized about convection ovens is that, although the heat is supplied to the work chamber from a stream of heated air, a considerable portion is actually transferred to the work by means of low temperature radiation from the oven walls. With the structure heavily insulated, as is now common practice, the walls reach a temperature very close to that of the inlet air. Since this is above curing temperature there is a considerable radiant heat transfer from walls to work. As oven temperatures are increased, greater portions of the total heat transfer take place in this way. The higher the oven temperature the lower are the temperature variations in the heated space due to "shadow effect." Radiant energy developed in this manner from a convective source is far more uniform in its distribution over the work surfaces than an equal amount obtained from primary infra-red sources.

Radiant intensities as high as or higher than available in the best infra-red units can be obtained with less danger of serious overheating. In fact, delicate finishes which discolour when cured rapidly under infra-red can be baked perfectly at identical rates using modern high-speed convection equipment. The flow of hot air around and through the load, much of which is normally shielded from the radiant effect of the oven walls, allows the 40 to 60% of heat, actually transferred by convection, to serve as the equalizing medium which produces the overall heating uniformity characteristic of convection ovens. It likewise allows the use of loadings far more dense than possible in infra-red equipment with corresponding increases in output per square foot of floor space occupied.

Present Equipment

Units now installed range from antiquated uninsulated sheet metal and brick structures heated by gas pipe burners lying along the floor or electric resistor elements hung on the side walls to infra-red units and modern convection ovens. Occasionally we encounter units heated by liquid or solid fuels burned in fire boxes below floor level. Some units are batch-type, many are conveyorized. Thousands of different pieces are processed. Standards of production and curing cycles vary radically. Care must, therefore, be exercised in pointing to the improvements obtained in finish, curing speed or fuel economy through the installation of modern ovens. This is equally true of many tests run with the intention of proving the relative merits of one or the other of the heating methods under discussion. Thus, when it is claimed that this or that type of unit has made extravagant reductions in curing cycles, it is well to examine carefully the type of equipment formerly used, the kind of finish, the actual parts involved, the relative heat inputs, and the heating method itself. Thorough analysis of a specific case frequently shows the spectacular results, attributed solely to type of heating, actually accrue largely from totally different elements of the design. High speed convection ovens are now available which will cure in 3 to 15 minutes finishes which require 30 to 60 minutes in the best designed convection units of only a few years ago. An extremely misleading impression of the relative heating speeds presently possible with convection and infra-red equipment can, therefore, be created by comparing new infra-red installations with convection ovens more than a year or two old.

Early infra-red applications were merely banks of lamps mounted in suitable reflectors held by an open frame-work on either side of a conveyor which carried the work. The fume condition thus created was uncomfortable for the workers and likewise constituted a serious fire hazard. Equipping the room with suitable exhaust fans pulled away the fumes but disrupted the cures because cold air from the floor was sucked up past the work, cooling off its lower portions. This air became hotter as it progressed from bottom to top, and a considerable temperature difference existed in the work piece, preventing an even cure.

Next came partial enclosure of the lamps plus the use of an exhauster on the baking unit itself. Room air flowed up past the lamp sockets, where it was slightly preheated, then down over the work and finally out through a bottom duct. At first this air was allowed to spill in over the topmost row of lamps, but later a portion of it was brought in around each lamp. Considerable improvement in uniformity resulted with the addition of this crude convection system to the basic infra-red unit.

The final step has been the completely enclosed tunnel with lamps surrounding the work piece. Thermally this type is more efficient (approximately 65% as compared to between 40 and 60% for open units), but the bottom lamps are particularly subject to a coating of paint drippings and the upper lamps to a baked-on layer of vaporized paint. This clouding or gumming of the bulbs reduces the effective radiant intensity, with the harmful results previously cited. Inaddition, excessive heat is retained in the bulb, resulting in greatly decreased life. The thermal shock created by paint dripping on the bulbs may crack them, exposing hot filaments directly to combustible thinner vapours. Guards may be installed to prevent this, but they likewise serve materially to reduce overall efficiency.

Worries are Legion

Small voltage changes also affect radiation intensities substantially. Lamp life expectancy averages about one year, but their output decreases radically over this period of service. Radiation intensity on work surfaces is constantly changing from all the above causes, and the worries of he who chooses to bake with infra-red are legion.

Great simplification results from convection systems having adequate heating speeds. Conventional convection ovens so far developed, however, have aimed principally at uniformity of finish rather than extreme baking speeds. With relatively few exceptions, they have distributed moderate volumes of air only slightly hotter than the maximum curing temperature. They have been equipped with full and fool-proof safeguard systems, and temperature control has been from oven temperature. Fuel economy in general has been good. In some instances units have been equipped with complex heat control and zoned air distribution systems. Such an arrangement allows work leaving the oven to preheat the make-up air. At the same time hot air being exhausted through the entrance zone flushes out most of the solvent vapours and also preheats the cold work. In addition to improving overall fuel economy, this system maintains minimum solvent vapour concentrations in the main baking zone. Final oxidation or polymerization can then take place more rapidly and thoroughly, with consequent improvement in lustre, gloss and hardness.

One major oven company has developed a convection system which may be applied to existing infra-red ovens. The "levelling influence" of convection heating mentioned under our earlier discussion of "Infra-red Characteristics" has thus been applied successfully. Other oven manufacturers employing infra-red sources for heating their ovens have found the use of an auxiliary convection system absolutely necessary to proper functioning of the equipment. Obviously, therefore, properly designed infra-red ovens must, and do, transfer large portions of their heat by means of convection.

Future Probabilities

Paint manufacturers indicate that post-war finishes will be far superior to any previously available. Motor vehicles, household appliances and the like will be designed for a longer service life than ever before. An integral part of such improvement is the development of better finish curing equipment. The stress will be on quality of product rather than extreme speed of cure. Too rapid heating results in blowholes and pitty finishes, especially if the thinners are heavier oils rather than highly volatile solvents. These circumstances, in most instances, favour convection rather than the infra-red sources as the basic heat transfer medium. For this reason many leading industries are already laying out their post-war production lines based on convection ovens.

Regardless of whether heat transfer is by means of convection or infra-red, a flat test panel of uniform thickness and colour may be processed perfectly in an amazingly short time. Arranging the same gauge of metal in a manufactured article, such as a cabinet, suitably reinforced with ribs or structural members, greatly retards the speed with which a perfect cure can be obtained. Processing time must be predicated on the heaviest section. Lowering the curing temperature apparently lengthens the period of time a piece may be held at that temperature without damage to its finish. To establish the correct treatment for any part, temperatures should be decreased and cycles lengthened until the heaviest section cures properly without over-baking the lighter sections. Heavy sections increase required heating times much more with infra-red than with convection. The greater the variance in thickness, the less adaptable are infra-red units because they overheat thin sections before the heavier ones can be brought to temperature. Universal adaptation of convection heating is thus favoured.

Although future stress is expected to be on quality rather than speed of bake, we must still be prepared to design ovens which will cure at optimum speed compatible with proper uniformity of finish. Time at temperature actually cures the finish, and every temperature in its allowable curing range requires a specified time, which decreases as the temperature is raised. In the interest of maximum speed, therefore, it is desirable to use the highest curing temperature possible. The decrease in time thus effected must, however, more than offset the longer preheat required to raise the work to this higher tempe rature.

(To be concluded)

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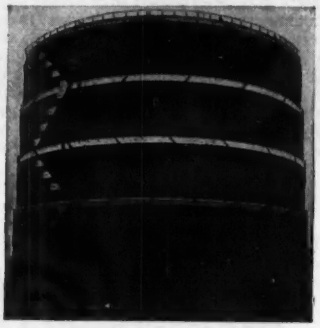

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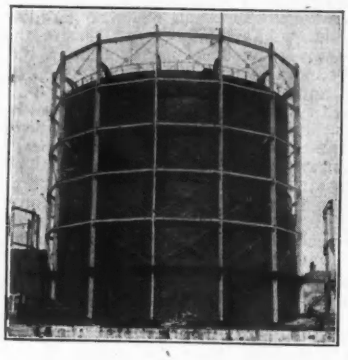

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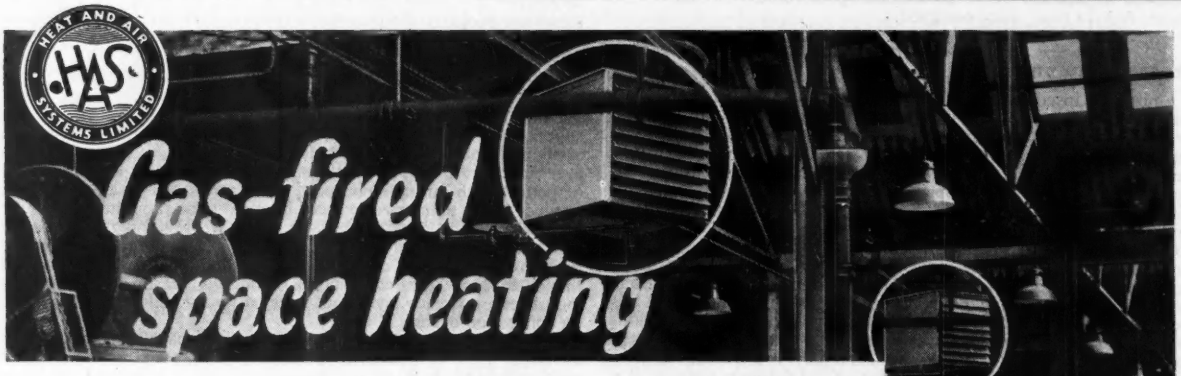

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GAS PRODUCTS PRICES

The London Market Sept. 3.

There have been two developments of interest in connexion with Coal Tar Products, the first being the cancellation of Government contracts for Toluene, and the second the issue of the Control of Benzole and Allied Products Order, 1945 (S. R. & O. 1945, No. 1064), which came into force on Sept. 1 and brings all Coal Tar Spirits under one and the same Order.

As from March 5, by the Coal Tar Products Prices Order, 1945 (S. R. & O. 1945, No. 229), the maximum price of Pitch for briquetting has been increased to 60s. per ton f.o.r. supplying works, and the prices for Road Tar, as fixed by the Coal Tar Products Prices Order, 1943, S. R. & O. No. 1528, have been increased by one half-penny per gallon. There is also an increase of 5s. per ton in the price of standard Creosote/Pitch Mixture.

Coal Tar Products Prices (No. 2) Order, 1944 (S. R. & O., 1944, No. 1051), allows increases in the maximum prices for all forms of Naphthalene.

The Provinces Sept. 3.

The average prices of gas-works products during the week were : Pitch and Crude Tar,* Toluole, naked, North, 90's. 2s. 4d. to 2s. 6½d., pure, 3s. 2½d. Carbolic acid, 60's, anthracene, creosote oil (hydrogenation), coal tar oils (timber preservation, &c.), and strained anthracene oil controlled by the Coal Tar Products Prices Order, 1943, dated Oct. 20, 1943 (S. R. & O. 1943, No. 1528), operative from Nov. 15, 1943, Naphthalene controlled under S. R. & O. 1944, No. 1051, operative from Sept. 22, 1944.

Attention is called to Coal Tar Products Prices Order, 1945 (S. R. & O. 1945, No. 229), referred to on p. 305, "JOURNAL" of March 7.

* In regard to pitch and crude tar prices we would ask readers to refer to the editorial note on p. 396 of the "JOURNAL" for Sept. 10, 1941.

Scotland Sept. 1.

New business is slow but deliveries *ex* Contract are maintained.

Refined tar*: Yield to Distillers is 5d. per gallon *ex* Works, naked. Creosote oil: Timber preserving quality,* 5½d. to 6½d.; hydrogenation oil*, 5¾d.; low gravity or virgin oil,† 7¼d. to 7½d.; benzole absorbing oil,* 6½d. to 8d. per gallon. Refined cresylic acid* is 3s. 6d. to 4s. 6d. per gallon *ex* Works, naked, according to quality. Crude naphtha†: 7d. to 8d. per gallon. Solvent naphtha*: Basic prices delivered in bulk, 90/160 grade, 2s. 10d., and 90/190 Heavy naphtha, Unrectified, 2s. 0½d.; Rectified, 2s. 4d. per gallon. Pyridine†: 90/160 grade 13s., and 90/140 grade, 15s. per gallon.

* Price controlled. † Uncontrolled.

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GAS STOCKS AND SHARES

Markets opened last week under the cloud of the cessation of lend-lease supplies and prices of a number of industrial shares weakened, but subsequent statements by President Truman had a good effect on markets generally, and at the close the tone had improved considerably.

The Gas Market was fairly quiet and there were few movements either way. It will be noticed, however, that Montevideo hardened again and at the local Exchange Newcastle units closed 9d. higher. Compared with a month ago the prices shown in the lists below contain any reactions on the Election results, and on the whole the reductions have not been too severe except in the case of a few ordinary stocks which have dropped anything from 5 to 9 points.

The following price changes were recorded last week:

PROVINCIAL EXCHANGES

Hartlepool Ord. (x.d.)	91—93	Aug. 27	
Newcastle Units	24/9—25/3	+—/9d.	

OFFICIAL LIST

Associated Gas & Water Ord. ...	22/3—23/3	—-/3d.
Commercial Ord. 5 p.c. Deb. (x.d.)	114—119	Aug. 27
East Surrey "B" (x.d.)	102—107	,,
Montevideo Ord.	112—117	+2
Primitiva Holdings Ord.	13/9—14/9	+2/6d.
South-Eastern Gas Corporation Ord. (x.d.)	20/3—21/3	Aug. 27
Ditto 4½ p.c. Red. Cum. Pref. (x.d.)	21/3—22/3	,,
Ditto 4 p.c. Cum. Pref. (x.d.) ...	19/9—20/9	,,

SUPPLEMENTARY LIST

Cheltenham Ord.	107—112	—1
East Surrey 6 p.c. Cum. pref. (x.d.)	127—132	Aug. 27
North Middlesex 5 p.c. Pref.	110—115	—2

Quotations on the London and Provincial Stock Exchanges

OFFICIAL LIST

Issue. £	When ex-Dividend.	Dividends Interest. Amnt. or Rate% Prev. Hf. Yr. Actual.	Last Hf. Yr. Actual.	NAME.	Quotations Aug. 30
1,767,439	March 12	20/-	20/-	Alliance & Dublin Ord. ...	112—117
891,664	May 7	6d.	6d.	Ascd. Gas & Water U'd'ts Ord.	22/3—23/3
388,938	,,	7½d.	7½d.	Do. Deferred	23/—24/-
500,000	March 12	2½	2½	Do. 4½ p.c. Red. Cum. Pref.	21/—22/-
535,545	,,	2	2	Do. 4 p.c. Red. Cum Pref.	20/—21/-
341,966	,,	2	2	Do. 4 p.c. Irred. Cum. Pref.	19/3—20/3
561,370	Aug. 20	70/-	70/-	Barnet Ord. 7 p.c. ,, ...	159—164
300,000	June 11	8⅜d.	10⅜d.	Bombay, Ltd. ,, ...	42/—45/-
690,407	Aug. 13	70/-	70/-	Bournemouth 7 p.c. max. ...	155—160
362,025	July 11	2	2	Do. 4 p.c. Deb. ...	102—107
659,955	March 5	25/-	57/-	Brighton, &c., 5 p.c. Con. ...	108—113
855,000	,, 12	60/-	60/-	Brit. Gas Light Ord.	120—125
545,000	June 25	2⅜	2⅜	Do. 5½ p.c. 'B' Cum. Pref.	115—120
120,000	,, 18	2	2	Do. 4 p.c. Red. Deb.	95—100
10,000	April 23	9/-	4/6	Cape Town, Ltd., 4½ p.c. Cu. Pf.	6—7
626,860	July 16	70/-	50/-	Cardiff Con. Ord.	120—125
24,500	June 4	8⅜d.	8⅜d.	Colombo 7 p.c. Pref.	23/6—25/6
764,169	March 19	4.78d.	4.78d.	Colonial Gas Assn. Ltd. Ord. ...	16/6—18/6
400,000	,,	7.649d.	7.649d.	Do 8 p.c. Pref. ...	22/—24/-
1,748,090	July 22 '40	30/-	30/-	Commercial Ord.	60—65
620,000	June 4	1½	1½	Do. 3 p.c. Deb.	74—79
286,344	Aug. 27	2⅜	2⅜	Do. 5 p.c. Deb.	114—119
807,560	,, 20	60/-	60/-	Croydon sliding scale	122—127
644,590	,,	50/-	50/-	Do. max. div.	104—109
620,385	June 25	2½	2½	Do. 5 p.c. Perp. Deb. ...	125—130
179,500	Aug. 27	50/-	50/-	East Surrey 'B,' 5 p.c.	102—107
176,461	June 25	2⅜	2⅜	Do. 5 p.c. Deb. (Irred.)...	122—127
239,135	Nov. 13	6d.	6d.	Gas Consolidation Ord. 'A' ...	22/3—23/3
250,000	,,	4½	4½	Do. Ord. 'B' ...	22/3—23/3
250,000	May 7	2	2	Do. 4 p.c. Red. Cum. Pref.	18/6—20/6
19,101,877	July 30	6d.	6d.	Gas Light & Coke Ord. ...	20/9—21/9a
2,600,000	,,	35/-	35/-	Do. 3½ p.c. max.	77—82
4,477,106	,,	2	2	Do. 4 p.c. Con. Pref. ...	101—104
2,993,000	July 16	1⅞	1⅞	Do. 3⅜ p.c. Red. Pref. ...	100—103
8,602,497	May 28	1⅞	1⅞	Do. 3 p.c. Con. Deb. ...	89—92
3,642,770	,,	2⅛	2⅛	Do. 5 p.c. Red. Deb. ...	106—109
3,500,000	,,	2⅛	2⅛	Do. 4½ p.c. Red. Deb. ...	106—109
700,000	March 12	1⅜	1⅜	Do. 3½ Red. Deb. ...	99—101
5,600,000	May 28	—	†£10	Imperial Continental Cap. ...	113—118
43,820	July 30	1⅜	1⅜	Do. 3½ p.c. Red. Deb. ...	97—100
2,167,410	Aug. 7	60/-	55/-	Liverpool Ord.	123—128
231,978	,, 13	50/-	50/-	M.S. Utility 'C' Cons.	108—113
918,657	,,	2	2	4 p.c. Cons. Pref.	100—105
675,000	April 30	‡40/-	‡40/-	Montevideo, Ltd.	112—117
300,000	,, 23	£6	£4	Oriental, Ltd.	177—182
368,537	June 11	50/-	57/6	Plymouth & Stonehouse 5 p.c.	110—115
621,667	Aug. 13	72/6	72/6	Portsmouth & Gosport Cons.	155—160
2,381,363	July 9	†9½d.	†9½d.	Primitiva Holdings, Ltd. Ord.	13/9—14/9
233,900	June 11	3	3	Do. 6½ p.c. Red. Cum. Pref.	102—107
648,999	July 2	6⅜	6⅜	Severn Val. Gas Cor. Ld. Ord.	23/6—24/6
597,972	March 12	2½	2½	Do. 4½ p.c. Cum. Pref. ...	22/—23/-
2,528,714	Aug. 27	6d.	3⅜d.	South East'n Gas Cn. Ld. Ord.	20/3—21/3
1,000,000	,,	2½	2½	Do. 4½ p.c. Red. Cum. Pref.	21/3—22/3
1,068,869	,,	2	2	Do 4 p.c. Irred. Cum. Pref.	19/9—20/9
6,709,895	Aug. 20	†40/-	30/-	South Met. Ord.	88—91
1,135,812	,,	3	3	Do. 6 p.c. Irred. Pref. ...	126—131
850,000	,,	2	2	Do. 4 p.c. Irred. Pref. ...	100—103
1,895,445	July 2	1½	1½	Do. 3 p.c. Perp. Deb. ...	87—90
1,000,000	,, 16	2½	2½	Do. 5 p.c. Red. Deb. ...	102—107
1,543,795	July 30	50/-	50/-	South Suburban Ord. 5 p.c ...	113—118
512,825	,,	2½	2½	Do. 5 p.c. Perp. Pref. ...	111—116
500,000	,,	2	2	Do. 4 p.c. Perp. Pref. ...	99—104
250,000	,,	1⅞	1⅞	Do. 3⅜ p.c. Red. Pref. ...	93—98
888,587	June 11	2½	2½	Do. 5 p.c. Perp. Deb. ...	123—128
750,541	Aug. 13	50/-	50/-	Southampton Ord.	107—111
350,000	,, 13	2⅜	2⅜	Swansea 5½ p.c. Red. Pref. ...	105—110
1,076,490	,, 7	50/-	50/-	Tottenham & District Ord. ...	113—118
338,555	,,	2½	2½	Do. 5 p.c. Pref.	110—115
453,380	June 11	2	2	Do. 4 p.c. Perp. Deb. ...	100—105
1,247,505	,,	7½d.	6d.	U. Kingdom Gas Cor. Ord. ...	21/—22/-
1,085,952	May 14	5⅜d.	5⅜d.	Do. 4½ p.c. 1st Cum. Pref. ...	22/6—23/6
772,709	,,	4⅜d.	4⅜d.	Do. 4 p.c. 1st Red. Cum.Pref.	19/9—20/9
745,263	June 18	5⅜d.	5⅜d.	Do. 4½ p.c. 2nd Non.Cum. Pf.	20/6—21/6
1,200,000	March 19	1⅜	1⅜	Do. 3½ p.c. Red. Deb. ...	97—102
380,606	Aug. 13	66/3	66/3	Uxbridge, &c., 5 p.c.	122—127
1,371,138	July 30	50/-	50/-	Wandsworth Consolidated ...	113—118
2,525,768	,,	2	2	Do. 4 p.c. Pref.	102—105
1,343,964	June 18	2½	2½	Do. 5 p.c. Deb.	123—128
383,745	,,	2	2	Do. 4 p.c. Deb.	100—105
558,342	Aug. 13	50/-	50/-	Watford & St. Albans Ord. ...	114—119

SUPPLEMENTARY LIST

Issue. £	When ex-Dividend.	Dividends Interest. Amnt. or Rate% Prev. Hf. Yr. Actual.	Last Hf. Yr. Actual.	NAME.	Quotations Aug. 30
351,685	June 18	2½	2½	Brighton, &c., 5 p.c. Perp. Deb.	122—127
415,250	,,	2	2	Bristol Gas Co., 4 p.c. New Deb.	101—104
140,205	July 30	70/-	70/-	Cambridge, &c., 7 p.c. Cons. 'B'	141—146
295,932	Aug. 20	50/-	50/-	Cheltenham, 5 p.c. Cons. Ord....	107—112
42,500	June 18	2	2	Do. 4 p.c. Perp. Deb....	100—105
150,000	Aug. 20	2	2	Croydon Gas, 4 p.c. Pref. (Irr.)	98—103
130,000	June 25	2	2	Do. 4 p.c. Deb. ...	100—105
53,220	Aug. 27	3	3	East Surrey, 6 p.c. Cum. Pref....	127—132
...	Aug. 19 '40	40/-	40/-	Eastbourne, 'B' 3½ p.c.... ...	97—102
117,425	March 1	—	£6	East Wight Cons. 5 p.c. ...	100—105
25,000	June 18	2½	2½	Guildford 4½ p.c. Red. Deb. ...	100—105
156,600	Aug. 13	50/-	50/-	Hampton C't, 5 p.c. Cons. Ord.	114—119
18,000	May 28	—	£7	Malta & Med'n., 7 p.c. 1st Pref.	85—95
10,845	,,	—	£7½	Do. 7½ p.c. 2nd Pref.	85—95
50,000	Aug. 13	52/3	52/3	Mid. South. Util., 'A' Cons. 5 p.c.	107—112
70,380	June 25	2½	2½	Newport (Mon.), 5 p.c. Deb...	120—125
65,000	Aug. 13	2½	2½	North Middlesex, 5 p.c. Pref....	110—115
70,000	March 12	2½	2½	Plymouth & Stone., 5 p.c. Deb.	124—129
76,501	June 18	2	2	Reading, 4 p.c. Perp. Deb. ...	98—103
74,777	April 3	2	2	Romford, 4 p.c. Debs. (Reg.) ...	98—103
21,000	June 11	2½	2½	Slough, 5 p.c. Perp. Deb. ...	122—127
211,740	,, 18	2½	2½	Southampton, 5 p.c. Red. Deb.	105—110
363,575	July 2	2½	2½	Tottenham, 5 p.c. Reg. Red. Mt.	99—102
202,019	April 23	75/-	75/-	Tunbridge Wells, 4 p.c. Scale ...	140—145
135,257	June 11	2½	2½	Uxbridge &c., 5 p.c. Perp. Deb.	122—127

PROVINCIAL EXCHANGES

					Quotations Aug. 27
804,948	Aug. 7	2½	2½	Bath Cons.	113—115
122,577	Aug. 20	4½	3	Blyth 5 p.c. Ord.	124—126
1,667,250	July 16	2½	2½	Bristol, 5 p.c. max.	118—120
120,420	June 18	2	2	Do. 1st 4 p.c. Deb.	102—104
415,250	,,	2	2	Do. 2nd 4 p.c. Deb. ...	101½—103½
328,790	,,	2½	2½	Do. 5 p.c. Deb.	122—124
157,150	Aug. 7	3½	2½	Chester 5 p.c. Ord.	115—117
52,500	June 18	2	2	Do, 4 p.c. Cum. Pref. ...	99—101
40,000	,,	2	2	Do. 4 p.c. Non. Cum. Pref.	99—101
36,430	,,	1⅜	1⅜	Do. 3½ p.c. Deb.	88—92
41,890	,,	2	2	Do. 4 p.c. Red. Deb. ...	100—102
542,270	Feb. 12	3	4½	Derby Cons.	135—140
55,000	June 18	2	2	Do. 4 p.c. Deb.	97—102
40,000	Aug. 7	5½	5½	Exeter 10 p.c.	185—195
10,000	,, 13	5	5	Great Grimsby 'A' Ord. ...	175—185
6,500	,,	5	5	Do. 'B' Ord.	175—185
79,000	,,	5	5	Do. 'C' Ord.	165—175
732,000	Aug. 27	2	2	Hartlepool G. & W. Cn. & New	91—93
490,681	June 18	1⅜	1⅜	Liverpool 3½ p.c. Red. Deb. Stk.	95—100
245,500	,,	2	2	Do. 4 p.c. Red. Deb. Stk.	102—103
306,083	July 2	2	2	Do. 4 p.c. Deb.	103—105
680,000	June 4	2½	2½	Do. 5 p.c. Red. Stk. ...	104—109
20,000	,,	2½	2½	Long Eaton 5 p.c. Pref.... ...	9—11
80,000	,,	2½	2½	Do. 5 p.c. Deb.... ...	117—122
2,430,267	Aug. 7	2½	2½	Newcastle and Gateshead Con.	24/9—25/3a
682,856	,,	2	2	Do. 4 p.c. Pref.	102—104
776,706	June 25	1⅜	1⅜	Do. 3½ p.c. Deb.... ...	100½—102½
250,000	,,	1⅜	1⅜	Do. 3½ p.c. Red. Deb. ...	100—102
73,186	April 23	2	2	Do. 4 p.c. Red. Deb. ...	102—104
106,280	Aug. 13	5	5	Preston 'A' 10 p.c.	185—190
188,219	,,	3½	3½	Do. 'B' 7 p.c.	140—145
1,806,339	Feb. 25	3½	3½	Sheffield Cons.	150—152
95,000	July 2	2	2	Do. 4 p.c. Deb.	98—102
332,351	Aug. 13	3	3	Sunderland 6 p.c. max. ...	122½—124½
192,150	,, 13	2½	2½	Weston-super-Mare Cons. ...	112½—114½
64,338	July 2	2	2	Do. 4 p.c. Deb.	99—101
33,340	,,	3½	3½	Do. 7½ p.c. Deb.	145—150

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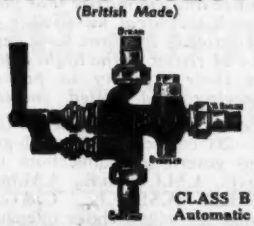

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APPOINTMENTS WANTED

CHEMICAL ENGINEER, age 34, with University degree and special knowledge in gas engineering and fuel research, wishes to obtain position. At present Lt. R.E., release October. Address No. 9468, "GAS JOURNAL," 51, High Street, Esher, Surrey.

APPOINTMENTS VACANT

None of the situations advertised in these columns relates to a man between the ages of 18 and 50 inclusive or a woman between the ages of 18 and 40 inclusive, unless he or she is excepted from the provisions of the Control of Engagement Order, 1945, or the vacancy is for employment excepted from the provisions of that Order.

COUNTY BOROUGH OF SOUTHPORT

(GAS DEPARTMENT)

APPOINTMENT OF DISTRIBUTION SUPERINTENDENT

THE Council invite applications for the temporary position of DISTRIBUTION SUPERINTENDENT at a commencing Salary of £360 per annum, rising by annual increments of £15 to a maximum of £405 per annum, plus the appropriate cost of living bonus.

Applicants must have a sound technical and practical training in all branches of distribution work, and must be experienced in the control of workmen.

The appointment will be determinable by either side on one month's notice, and will be subject to the provisions of the Local Government Superannuation Act, 1937. The selected candidate will be required to pass a medical examination.

Applications, stating Age, Qualifications, present appointment and duties, and full details of Experience, accompanied by *copies* of not more than three recent Testimonials, must be delivered to the undersigned, endorsed "Distribution Superintendent," not later than September 12, 1945.

Canvassing, directly or indirectly, will entail disqualification.

Town Hall, Southport. R. EDGAR PERRINS,
August 24, 1945. Town Clerk.

ENGINEERING ASSISTANTS

TWO Engineering Assistants are required, with drawing office experience. One of the Assistants to have specialized knowledge of the manufacture and design of coal and coke handling plant, and the other specialized knowledge of vertical and horizontal carbonizing plants. Applicants should give particulars relative to Age, Salary required, academic qualifications, workshop experience and positions held. Applications to be addressed to the United Kingdom Gas Corporation, Limited, Swettenham Hall, Swettenham, near Congleton, Cheshire, and endorsed "Engineering Assistant."

A PROGRESSIVE small Undertaking (40 millions) in Devon invite applications for the following:

(*a*) Experienced all-round GAS FITTER. Wages 1s. 8¾d. per hour.

(*b*) IMPROVER (District trained). Wages 1s. 5¾d. per hour.

Applications should give details of Training, Experience and Examinations passed. Testimonials are not required in the first instance. Address, No. 9466, "GAS JOURNAL," 51, High Street, Esher, Surrey.

WANTED.—Experienced MAIN LAYER, permanent post. Rate of pay, including War Bonus, £4 10s. 11d. per week of 47 hours, plus participation in Co-partnership and Pension Fund. Apply General Manager, Weston-super-Mare and District Gas Company' 32, The Boulevard, Weston-super-Mare.

WELLINGTON SALOP GAS COMPANY

MAIN AND SERVICE LAYER required. Present rate 1s. 11d. per hour, 47-hour week. Applications with Particulars, Experience and References to the Engineer, Gas-Works, Wellington, Salop.

CHEMIST with honours degree or previous experience required as ASSISTANT for work on design development and testing of gas-heating appliances. Laboratory London district. Salary according to qualifications. Write Box A8181, Samson Clark, 57/61, Mortimer Street, W. 1.

APPLICATIONS are invited for the position of WORKING MANAGER of the Aspley Guise and Woburn Sands Gas Company, Ltd., at a salary of £300 per annum with free house and fuel provided. Applicants should have a thorough practical knowledge of small Works routine and management, with sound ability to control labour.

Applications, stating Age, Training and Experience, together with *copies* of three Testimonials, should be sent to General Manager, Bedford District Gas Company, Ford End Road, Bedford.

THE Liverpool Gas Company invites applications for the Position of WORKS MANAGER of their Linacre Works. The Salary will be in accordance with qualifications, but will not be less than £750 per annum, inclusive of all bonuses. The successful applicant will be required to pass the usual pre-employment medical examination, and if not more than 45 years of age, will be admissible to the Officials' Superannuation Fund, in addition to the Co-Partnership Scheme. Applications should be made on the official application form, which may be obtained by writing to the General Manager, Radiant House, Bold Street, Liverpool, 1, and which should be returned to him not later than September 15, 1945.

WANTED.—First-class DRAUGHTSMAN experienced in Gasholder and Gas Plant Work. Apply to Firth Blakeley, Sons & Co., Ltd., Church Fenton, Yorks.

NEWTON CHAMBERS & CO., LTD., Thorncliffe, Sheffield, require the services of two SENIOR DRAUGHTSMEN experienced in the preparation of drawings for gas-works plant. Applications, which will be treated in the strictest confidence, stating Age, Experience, and Salary required, should be sent to the Personnel Officer.

A PROGRESSIVE Seaside Gas Undertaking (50 millions) in Cornwall has vacancies for the following:

(*a*) FIRST-CLASS GASFITTER (District), 1s. 8¾d. per hour.

(*b*) MAINTENANCE FITTER, 1s. 8d. per hour.

(*c*) IMPROVER, 1s. 5¾d. per hour.

Applications, giving details of training and experience, should be addressed to No. 9470, "GAS JOURNAL," 51, High Street, Esher, Surrey.

CITY OF NOTTINGHAM

(GAS DEPARTMENT)

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Applicants must have a sound practical knowledge of Gas Distribution Practice, be a good organizer, and capable of controlling and developing consumer goodwill and service. Experience of Showrooms, Exhibitions and propaganda work is essential for the development of Domestic and Industrial loads. The successful candidate will also be required to control the Fittings, Appliance, Renovation and Meter Repair Sections, and will be directly responsible to the Deputy Engineer and Manager.

The appointment is subject to the provisions of the Local Government Superannuation Act, 1937, and the successful applicant will be required to pass a medical examination and to reside within the City.

Applications, stating Age, full particulars of Training, Experience, and Qualifications, together with the applicant's position in relation to the Essential Works Order and National Service Acts, and accompanied by *copies* of two recent Testimonials, should be addressed to the undersigned not later than Monday, October 8, 1945.

Guildhall, J. E. RICHARDS,
Nottingham, Town Clerk.
September, 1945.

EDITORIAL ASSISTANT required immediately to deal with the editing, printing and distribution of the publications of The Institution of Gas Engineers and of the Gas Research Board. Commencing Salary £500 per annum. Applications, giving Age, Experience and other relevant information, to be sent to The Secretary, The Institution of Gas Engineers, 1, Grosvenor Place, London, S.W. 1, not later than September 12, 1945.

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APPLICATIONS are invited for the Position of SHIFT SUPERINTENDENT at the Works of the above Company.

Applicants must have a sound knowledge and practical experience of continuous Vertical Retorts, Waste-Heat Boilers and Ancillary Plant. Salary £420 per annum, inclusive of War Bonus. A Co-Partnership Scheme is in operation and also an Officers' Superannuation Fund.

Applications, stating Age, Training, &c., together with position regarding Military Service and Essential Works Order and accompanied by *copies* of two Testimonials, must be delivered to the undersigned not later than September 17, 1945.

Fishergate, A. K. COLLINGE,
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PRESTON GAS COMPANY

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APPLICATIONS are invited for the Position of DRAUGHTSMAN at a Salary of £425 per annum, including War Bonus.

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Applications, stating position with regard to the Essential Works Order and accompanied by *copies* of two recent Testimonials, should be delivered to the undersigned not later than September 17, 1945.

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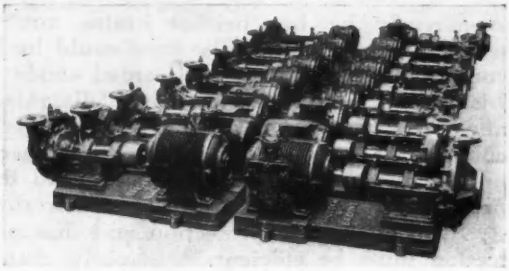

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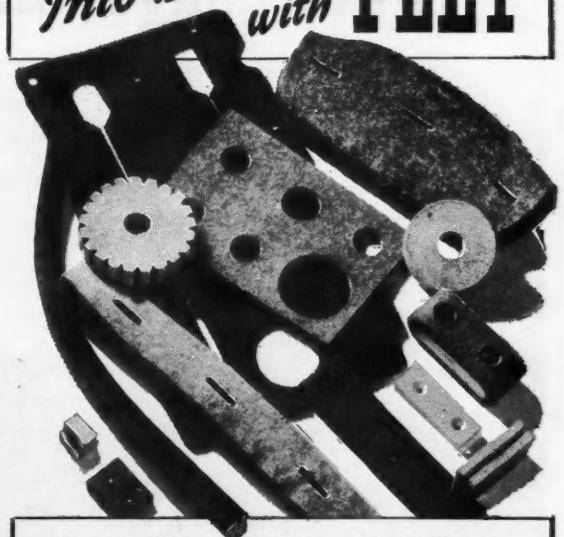

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These conveyors cut costs by 75%

CRONE & TAYLOR LTD., SUTTON OAK, ST. HELENS, LANCS.

She will look for the sign of a good washing machine —it's fitted with an Acme

★

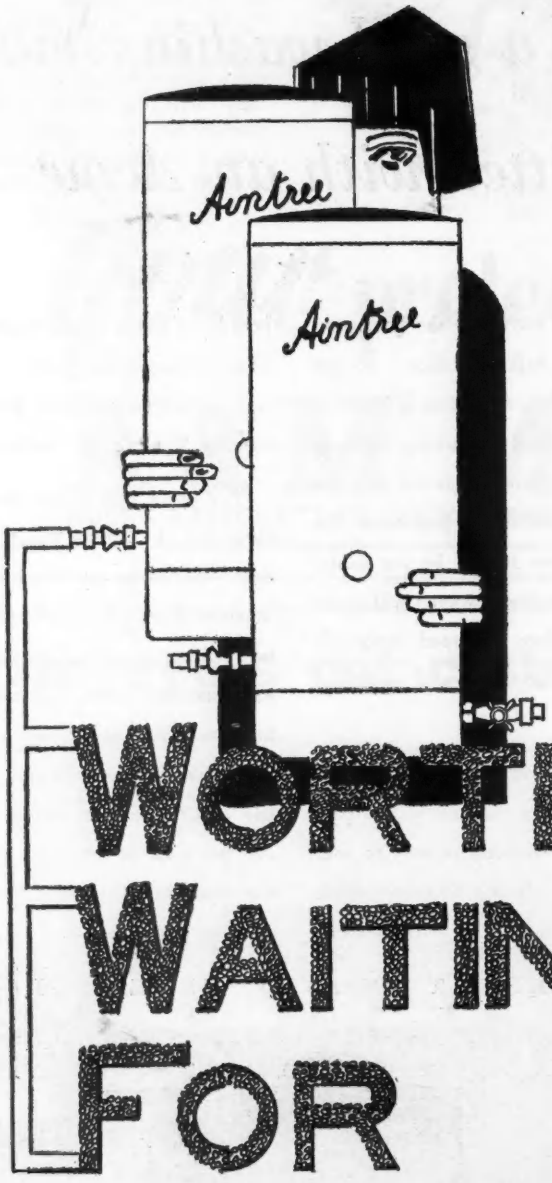
IT DIDN'T TAKE LONG in the good pre-war days for women talking "shop" to get round to the Acme. "You can't beat it", they'd agree. When they bought a washing machine they would look to see if it was fitted with an Acme 55. That was their test of perfection. In the good days of peace it will be the same. The Acme will be the wringer women will again call for, and the washer equipped with the Acme will for them bear the sign of well-tried honest worth.

Your work has given you the same experience as the housewife's from a different angle. She says the Acme is light, convenient, easy to use. You know the distinguishing features which make it all these things. The twin folding boards, to guide clothes neatly into the rollers. The two-way drain, that keeps water from getting on to floor or skirts. The reversible turning handle. The rustless bearings.

You know that in the future, as in the past, these are the points which will make women eager to possess an Acme — and the washing machine fitted with an Acme. When your business is back to normal and you begin to prepare for peacetime sales, see that all the washing machines you stock are equipped with an Acme 55 cleanser-wringer. You may be sure the after-the-war Acme will be the same 100 per cent perfect job. And the after-the-war woman will demand it — and the washing machine which has it fixed.

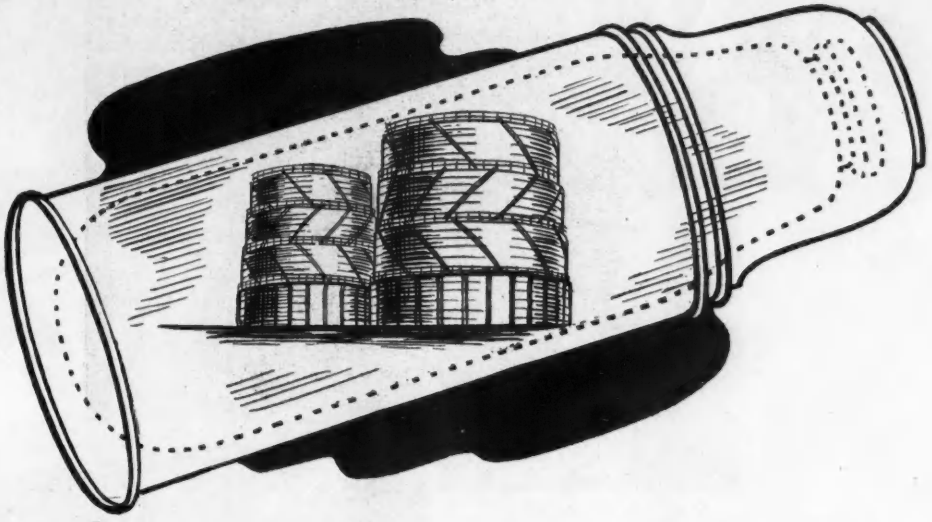
ACME WRINGERS LTD · DAVID STREET · GLASGOW · S·E

ACME



WORTH WAITING FOR

J H ROBINSON & CO (L'POOL) LTD
MILL LANE OLD SWAN
LIVERPOOL



If it were possible ....

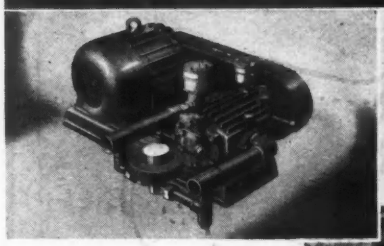
Looks a bit fantastic—but, after all, what *is* the idea behind a vacuum flask? Isn't it to provide a "*wall*" to keep the air from coming in contact with the container? And coming down to gasholders in real life, isn't that just what happens when they are protected with Dixon's Silica-Graphite Paint. Drying with a hard leathery skin having sufficient elasticity to expand and contract with varying temperatures, Dixon's *does* keep the atmosphere from reaching the "container" and most effectively prevents corrosion from attacking the surface. There's many a good gasholder presenting a blameless face to the world to-day thanks to Dixon's Paint—but what of the others? We are at their service too.

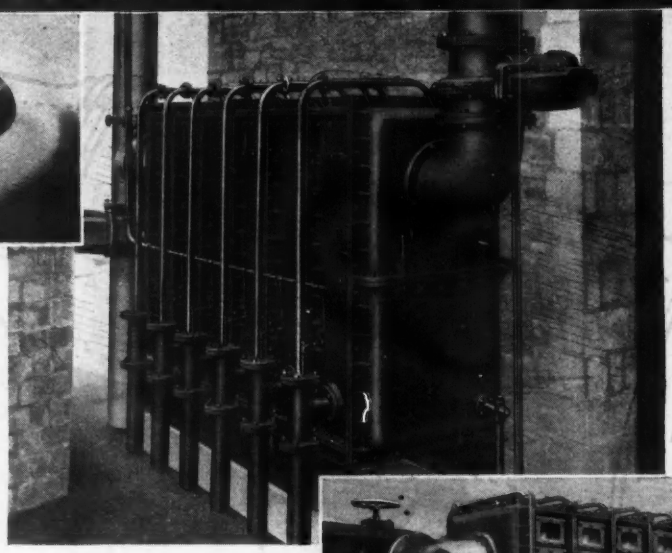
DIXON'S
SILICA-GRAPHITE
PAINT

THE CHEAPEST PAINT · PER YEAR OF SERVICE ·

C. R. AVERILL LTD., 22 Duchy St., Stamford St., London, S.E.1
Telephone: WATerloo 4732/3. Telegrams: "Crucigraph, Sedist, London."

PUMPLESS STATIC WASHERS





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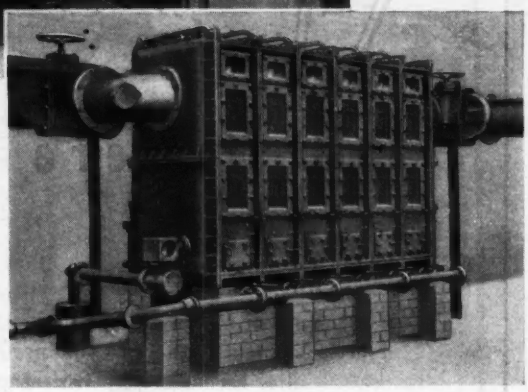

New Simplified Circulating System

Mechanically operated parts with their maintenance troubles and worries are now eliminated by the introduction of this Clapham innovation for liquor circulation in static ammonia, naphthalene and benzole washers.

The only mechanism in the plant is a small compressor easily housed in the exhauster or other suitable position, and compressed gas is used to circulate the liquid, the gas being returned to the gas stream after giving up its mechanical energy. The chief trouble in existing systems is thereby completely eliminated, as the liquid does not contact any moving part.

The installation embodies a neat and compact arrangement which is now standard in all Clapham washers.

CLAPHAM-BARWICK

"PUMPLESS" LIQUOR CIRCULATING SYSTEM

CLAPHAM BROS. LIMITED

MAKERS OF GAS WORKS EQUIPMENT SINCE 1837

KEIGHLEY-YORKS - Tel: 276-278 - Grams: "Clapham Bros., Keighley."

Pipes

IT WAS FROM THIS 150 years old Glasgow pipe factory that Thomas Carlyle bought his pipes at 3/6 a gross! But possibly you are more interested in pipes of another sort—those through which gas is distributed. In that case you will also be interested in Crane Pipe fittings, which ensure stronger and more reliable pipelines.

The TAPER-TO-TAPER THREADS of Crane Fittings, by making solid metal-to-metal contact throughout their entire length, ensure stronger joints free from corrosion.

CRANE

FITTINGS FOR ANY PIPELINE

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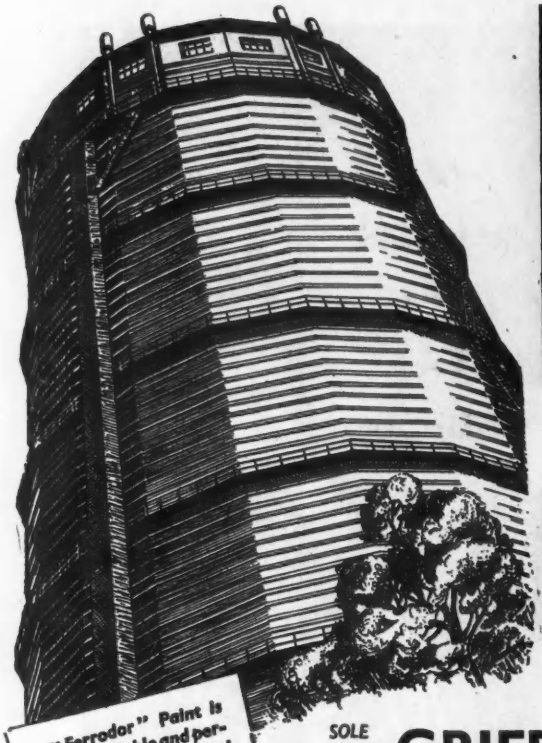
Branches at GLASGOW · BIRMINGHAM · BRISTOL · MANCHESTER



Give GASHOLDERS and other steel structural work the best possible

PROTECTION from RUST *and ATMOSPHERIC CORROSION*

Owing to its exceptional rust-inhibiting properties, "Ferrodor" Metal Protection affords great economy in labour and reduces maintenance costs to the minimum

FERRODOR REGD.

METAL PROTECTION

"Ferrodor" Paint is still available and permitted for essential maintenance work

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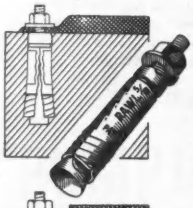
RAWLPLUG FIXING DEVICES

Solve all your Fixing Problems

RAWLPLUGS

There is a RAWLPLUG for every size of screw and coach screw, from the tiny No. 3 for light wiring to the large No. 28 which will withstand a direct pull of over 4 tons. Rawlplug fixing is safer, quicker and neater than any other method.



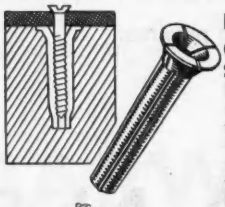
RAWLBOLTS

The use of RAWLBOLTS requires the minimum of time, labour and tools. No grouting is needed. No time-lag waiting for cement to dry. Made in two types—bolt projecting and loose bolt type—they solve every bolt-fixing problem. Available with pipe clips, round and square hooks and eye bolts. Size ¼ in. to ¾ in. diameter. Standard Whitworth thread.

BOLT ANCHORS

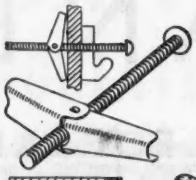
The RAWLPLUG BOLT ANCHOR is especially designed for fixings of a specialised nature. Unaffected by atmospheric conditions it can be fixed below water if necessary. Full range of sizes available and the anchors will take bolts from ¼ in. to 1¼ in. diameter.

WRITE FOR TECHNICAL LITERATURE TO:
THE RAWLPLUG CO., LTD., LONDON, S.W.7



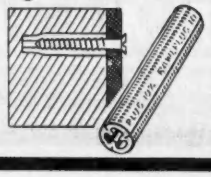
RAWLPLUG METAL PLUGS
(Screw Anchors)

Specially suited for use where the plug is likely to be subjected to extreme climatic conditions. Made in sizes to take screws from No. 8 to No. 14 and lengths from 1 in. to 2 in. Designed with flange for hollow brick work and to stop plug being inserted too far in hole.



TOGGLE BOLTS

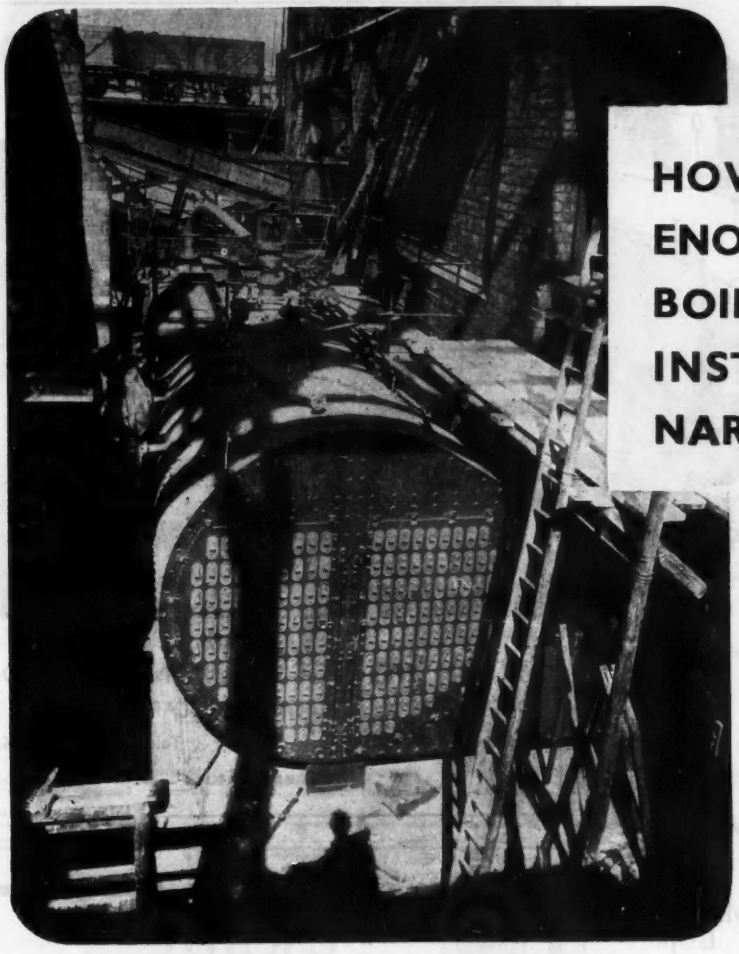
Toggle Bolts provide an ideal means of making secure fixings to hollow partition walls or ceilings, i.e. lath and plaster, asbestos board, etc., as they distribute the strain over a wide area.



WHITE BRONZE PLUGS

Specially designed for outdoor jobs where a metal plug is specified or preferred. One end of the plug is "coned" to facilitate the entrance of the screw when it is first inserted.

B311



HOW COULD A LARGE ENOUGH WASTE HEAT BOILER BE INSTALLED ON THAT NARROW SITE?

RESTRICTED space presented a real problem when it was decided to utilise the waste heat from a bank of Horizontal Retorts at Cheltenham. The photograph shows how the problem was satisfactorily solved by installing a 9′ 0″ dia. Cochran "Sinuflo" Waste Heat Boiler designed for 10,000 lb. per hour. The special "Sinuflo" tube design secured the needed capacity in spite of space restrictions. If you have a boiler problem we think it might pay you, too, to consult

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COCHRAN & CO., ANNAN, LTD., ANNAN, SCOTLAND, & 34, VICTORIA STREET, LONDON, S.W. 1.

TAS/CH 250

for
STREET LIGHTING
in Town & Village —

In every town and village, in fact, wherever Gas is used for Street Lighting, lamps should be fitted with Peebles Street Lamp Governors.

First, on the score of economy. As less gas is consumed, Street Lighting is cheaper.

Second, a governed lamp gives *better* light because the pressure and volume at burners is correct at *all* times, regardless of the Mains pressure.

Third, mantles last longer.

Every Public Lighting Department can make a big saving in Street Lighting costs by fitting

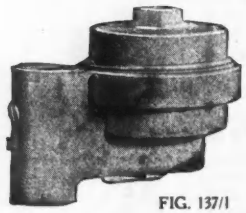

FIG. 137/1

ALSO HORIZONTAL OR FOR DOWNWARD FLOW

Peebles
STREET LAMP GOVERNORS

Sample sent to any Gas Manager for test, on request

PEEBLES & CO. LTD., TAY WORKS, BONNINGTON, EDINBURGH
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Best of Fittings

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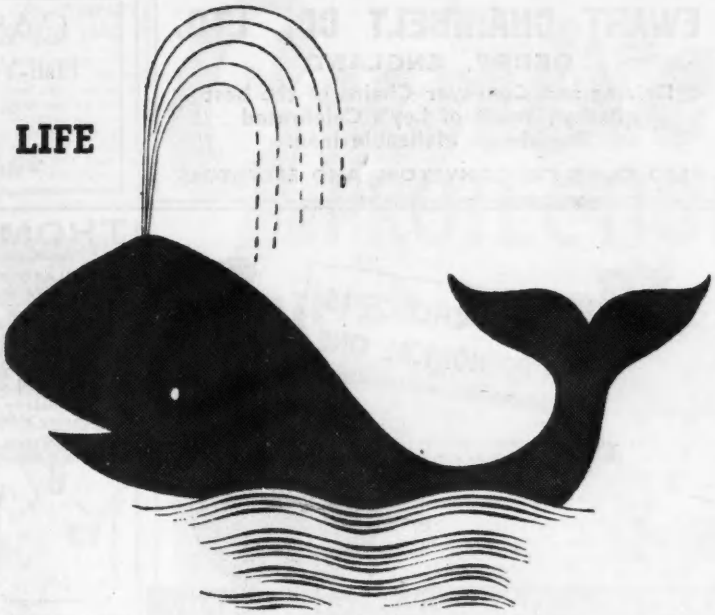
In addition to having great strength and long life, the Britannia Steel-Alkaline Battery is compact, light in weight, unaffected by long periods of idleness, and able to withstand shocks, vibration and the most severe operating conditions of traction service. It is the ideal traction battery.



Britannia STEEL-ALKALINE BATTERIES

FOR POWERING ELECTRIC VEHICLES AND TRUCKS

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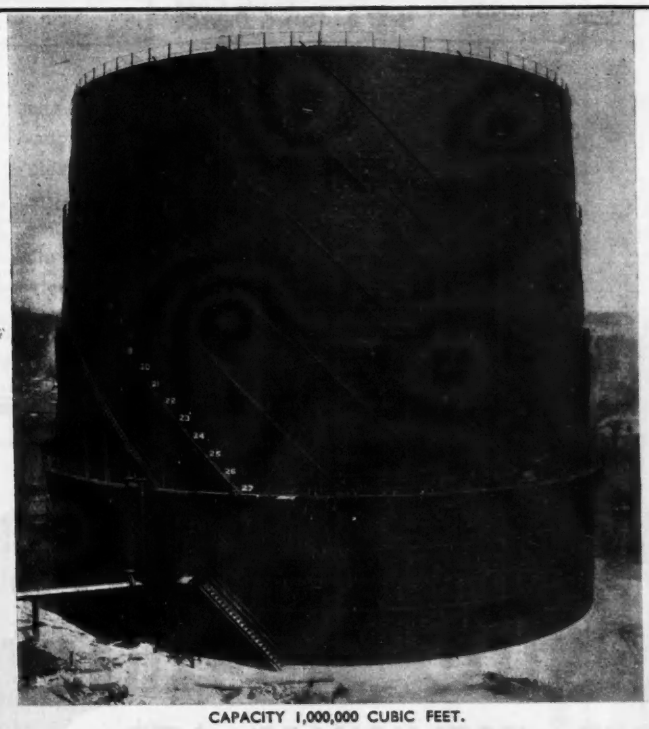

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WITH OR WITHOUT

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MILBOURNE PATENT SELF LUBRICATING ROLLER CARRIAGES

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ALSO COMPLETE CONVEYORS AND ELEVATORS

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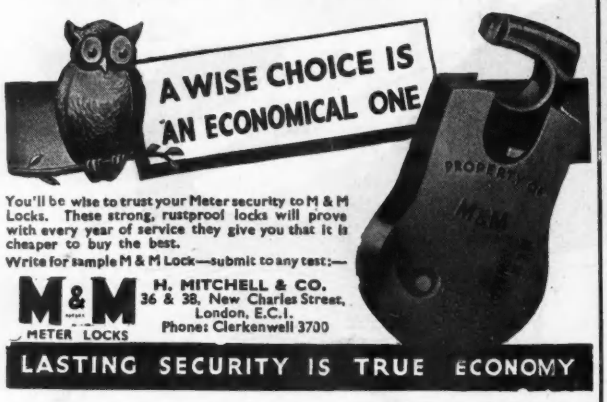
5/- each, post free.
Walter King, Ltd., 51, High Street, Esher, Surrey.



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Contractors to H.M. Government.

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Impervious to Main Liquor and Climatic Influences.

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UNDERPRESSURE CONNECTIONS, SPLIT COLLARS, SOCKET CLIPS
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Be Sure and Safe by using OUR PATENT "SAFETY" { C.I. TEES, PLUG CAPS / Main BAGGING DEVICE
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In these days when the need for increased output is vital, a reliable Mechanical Handling Plant is absolutely necessary. Why not consult us? We can still supply to essential industries, and our sixty years' experience will ensure that you get the best possible plant for your particular job.
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Sets like a ROCK under heat
ONX 'SUPER B3' BRAND for RETORTS
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If you need
PRESSURE DIECASTINGS
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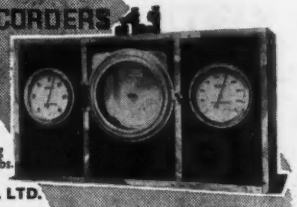
Formerly Die-Casting Department of H. GILL STAMPINGS Limited

METRONIC
GAUGES
INDICATORS
RECORDERS



A comprehensive range of pressure and flow measuring instruments, all operated by modified U tubes for sheer sensitivity. Flow Indicators and Recorders are driven by the latest METRONIC Ring Balance movement carried on Floating Ball Journals, which supersede knife edges.

A particular interest is taken in devising special apparatus for "out-of-the-ordinary" jobs.

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Gunite is PROTECTION against abrasion

Gunite—concrete applied by air pressure—has numerous applications where its great density and extreme adhesion have particular value.

For lining coal bunkers and steel chimneys it is an ideal material, possessing great resistance to corrosion and protecting steel-work from the abrasive action of the raw coal.

For repairing reinforced concrete it has particular merit, as, due to the method of application, a uniform density and adherence is obtained in whatever place the Gunite is applied, thus overcoming the common fault with hand-placed methods.

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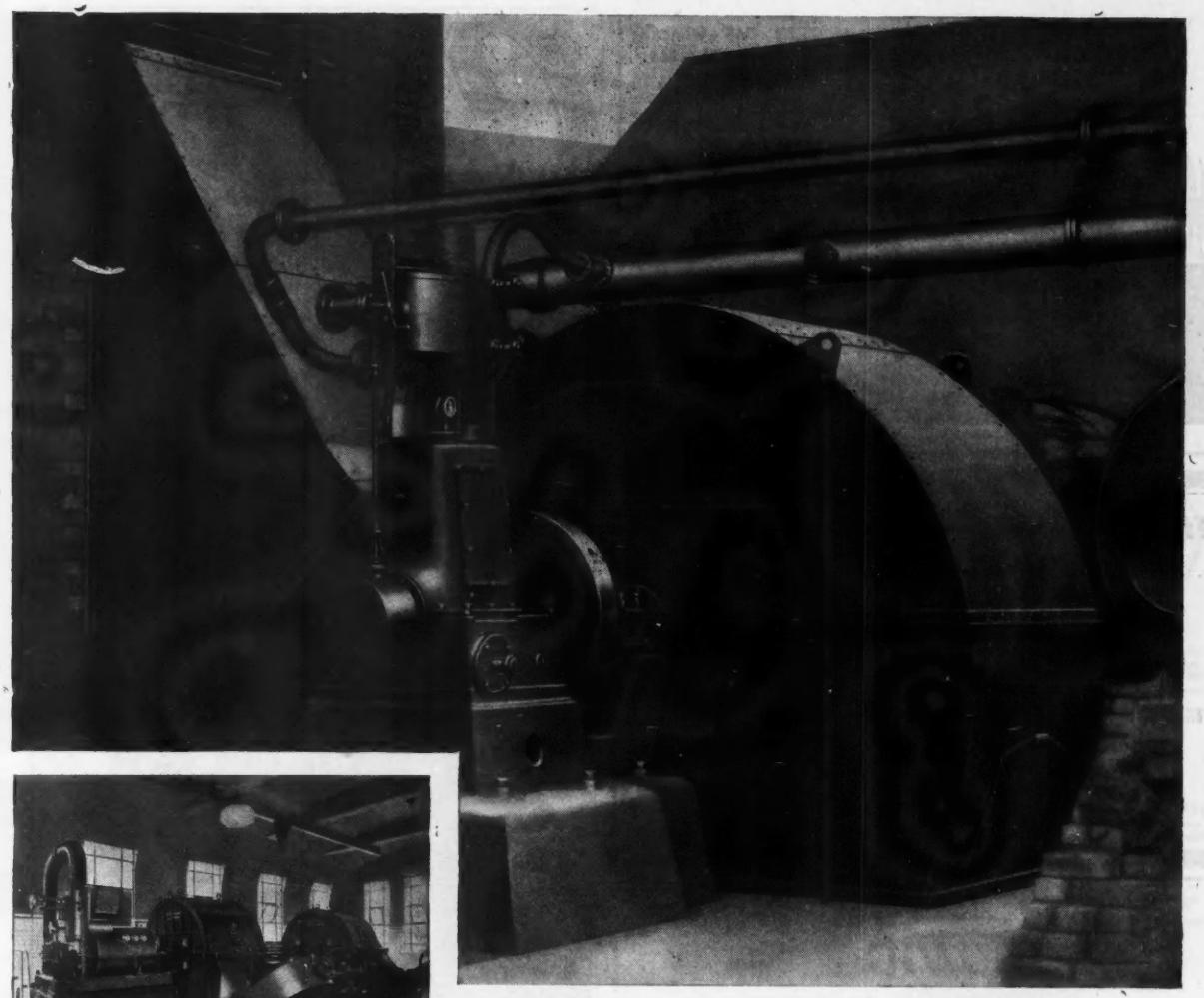
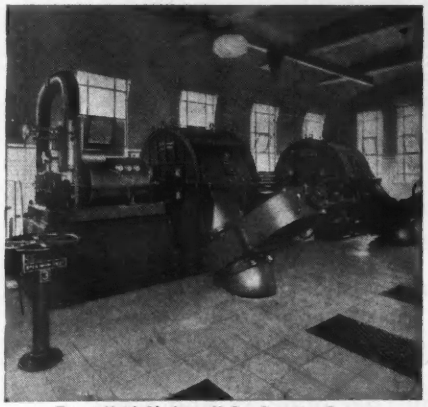


"Keith" Centrifugal Fan providing induced draught to boiler fires.



Two "Keith Blackman" Gas Boosting Fans at large Gas Works.

There is a KEITH BLACKMAN FAN for every purpose in the Gas Industry for which a fan is essential . . . . .

Mechanical Draught Fans
Fans for Gas Boosting
Cold Air Douche Fans
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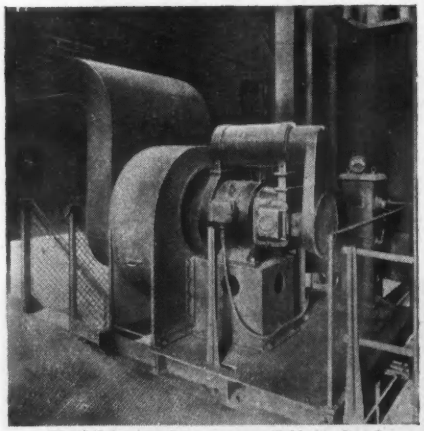
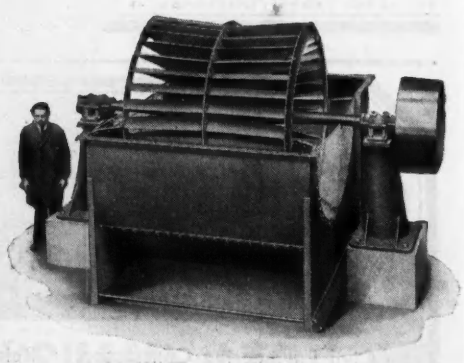
Fans for Forge Blowing, etc.



"Keith" Fan supplying air to a Cold Air Douche Plant at a Gas Works.

KEITH BLACKMAN FANS



Large belt-driven double-inlet "Keith" Fan with top casing removed.

KEITH BLACKMAN LTD., MILL MEAD ROAD, LONDON, N.17. TEL.: TOTTENHAM 4522. TA.: "KEITHBLAC PHONE LONDON"

Printed by Straker Brothers, Ltd., London, E.C.2, for Walter King, Limited, 11, Bolt Court, Fleet Street, London, E.C.4.—Wednesday, September 5, 1945.

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MAINLAYING AND GASWORKS CONSTRUCTION OF ALL TYPES

EMERGENCY WORK
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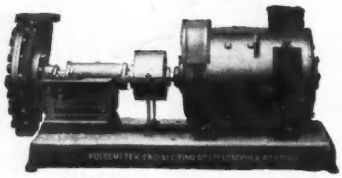
PUMPS FOR GAS WORKS

The Pulsometer Engineering Co. have for many years supplied pumps of many types to meet the varied duties required in modern Gas Works. These include a wide range of standard centrifugal designs for general water supply and cooling water services for clean water, and specialized pumps constructed in the metal most suitable for pumping the various special liquors met with in the recovery of by-products.



"Pulsometer" Two-bearing Pump

A special two-bearing assembly has been designed for pumping liquors of a harsh nature, with no lubricating effect on the bush. These bearings carry the weight of the rotating parts without the assistance of an internal bush. This hood can be adapted to any end-suction "Pulsometer" centrifugal pump.

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STATIC WASHERS

for

AMMONIA AND BENZOL EXTRACTION

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MAXIMUM:

(*a*) Wetted Surface possible by using Corrugated Sheet Steel Bundles.

(*b*) Tar Fog Extraction by High-Speed Sprays.

(*c*) Strength Liquor with Minimum Water or Weak Liquor Supply.

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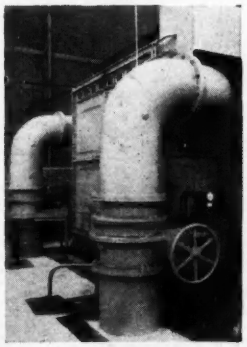

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